

Kenneth S. Norris Field Notes

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Contents

1949	1
Baja California		
1950	84
Sonora, Mexico; Baja California; Arizona; San Bernadino County, Panamint Mountains		
1950-1951	.....	135
San Nicolas Island; Baja California; Sinaloa; Sonora		
1951-1952	.....	172
Riverside County; Baja California; Guadalupe Island, B.C.; Middle Coronado Island, B.C.; N.E.L. Dock; La Jolla; Punta Banda, B.C.; Rock House Canyon		
1952	.....	204
Santa Catalina Island; San Clemente Island; Baja California		
1953-1954	.....	243
Colorado River Trip; Pushawalla Palms; Santa Barbara; Baja California		
1955-1958	.....	263
Baja California; Santa Catalina Island; Pushawalla Oasis; Guaymas, Mexico; Seal Trip; San Felipe Tursiops Trip; Pilot Whale Capture		
1955-1960	.....	315

Sturgeon Trip; Tursiops Reconnaissance, Baja Coast; Reconnaissance Trip to British Columbia;
Letters from Hawaii; Sawfish trip to San Blas, Mexico

1961-1963 364

Sonora, Mexico; Los Angeles Bay, Baja California del Norte; Puerto Refugio, Angel de la Guarda
Island; Ensenada; Scammon's Lagoon; Mulege, Baja California Sur; San Esteban Island

1967 & 1971 391

Amazon Trip; Northwestern Hawaiian Islands

1967 436

Panama; Ecuador; Galapagos Islands; Balboa

1968 463

South America

1971-1975 615

Whale hunt on the Alpha Helix; Magdalena Bay, Mexico; Granite Mountains, San Bernardino
County, California; Point Reyes, Marin County; Bluff Camp, Carmel River; Santa Cruz Island,
Santa Barbara County; Yolla Bolly Mountains, Tehama County; La Paz, Baja California, Mexico;
Whale tracking, Baja California

1975-1976 691

Outer Continental Borderland Cruise, Vantuna; Cruise on board Regina Maris, off Newfoundland
St. Pierre, Sable Island and Boston; Cruise on Elizabeth C.J. and David Starr Jordan to tropical
Eastern Pacific yellowfin tuna grounds; "Behavioral Cruise"

1977-1979 783

Granite Mountains; Big River; Villa Creek; Tuolumne River; Magdalena Island; Big Creek;
Magdalena Bay; Northern Gulf of California

1979-1980 854

Granite Mountains; Mattole River; Tuolumne River; Kealake'akua Bay, Hawaii; Mojave Desert;
Big Creek

1982-1983 921

White Mountains; Queensland, Australia; Granite Mountains; Mono Lake; Tahiti; Moorea; Bora
Bora

1984-1985 963

Baja California; Granite Mountains; French Camp; Mattole River; White Mountains; Kern River Gorge; Mono Lake; Wrangell Mountains National Park, Alaska; Solano Co.; "Humphrey" the Humpback Whale Rescue

1986-1988 1000

Granite Mountains; Steve Gliessman's Journal; Inyo Mountains; Thoughts at the End of Field Quarter; Joel Dunlap's Last Day Notes; Observing; SNARL; Democrat Springs; Vaya Maria Padaskeva's & My Great Adventure; Niche Hunts

1989 1026

Tanzania; Kenya; Malawi; Germany; White Mountains

1991 1057

Grand Bahamas; White Sand Bank; Tahiti; Moorea; New Zealand; Australia; Desert Futures; Roger Samuelsen; Global Field Theory of Sand Dunes Protecting the Desert; John Burroughs Medal; Kolmardens Djurpark, Sweden; Galveston, Texas; Bernd Wursig; Japan Trip; Trip for National Geographic; Hawaii with Jan and Ania; Woods Hole, Massachusetts

1992-1993 1143

"Beluga Adventures": Anchorage-Fairbanks-Nome, Alaska; Baffin Island-Iqaliut; Greenland; Edmonton, Canada; Gulf of St. Lawrence

June-July 1949 Baja California

June 13, 1949

20 miles N of Ensenada, Baja California

11:30. Left Los Angeles after much packing and last-minute purchases in company with Chuck Lowe and Arlene Lowe. Our trip is to last 38 days and is to take us to Cape San Lucas and back.

The sky has been overcast all day and the air cool. We drove to San Diego by the Coast route, stopping there for a brief chat with Cy Perkins and Chuck Shaw. Dr. K. Canber wanted us to buy specimens for him, but we do not have space to do so.

At the border we drove through with no questions asked at all. As a matter of fact we were the only ones who did any asking. We obtained insurance (Collision, Public Liability, and property damage) for 52 cents per day—\$10,600 coverage total. This was obtained from the America Insurance Co. They gave us a windshield sticker.

We drove on to our camp noting an unusual amount of DOR snakes. The species seen were *Lichanura roseofusca*, *Masticophis piceus*, *Coluber lateralis*, *Pituophis c. annectans*, banded and striped phase of *Lampropeltris g. californae*.

Camped at about 8:00 PM and ate a welcome meal. We are camped in the old spot under oaks and sycamores along a stream in which *Hyla* can be heard calling in a desultory sort of manner. It seems wonderful to be in the field again after all the mental anguish of preparations and dealing with numbers of people who consider Baja California their own.

June 14, 1949

Bahia San Quentin, Baja California

Today everything seemed doomed to complete failure.

7:30. Arose to be greeted by clouded skies and cool weather. The small creek by our camp had a few ponds among the sycamore and oak roots. I saw 6 or 7 Bluegill in one pond, some 4 or 5 inches long. We then drove to Ensenada, changed our money, bought a few items, and took the car into the Dodge garage to have the slight shimmy corrected.

Upon raising the hood we saw oil over everything. The garage attendant (who was the skinniest man I have ever seen, about 1½ inches through the middle) said our 4-wheel drive bushing was leaking and all the oil was coming out of the front differential. This meant we must go back to San Diego and through U.S. Customs with all our plunder. A young fellow named Antonio Escalante looked the car over and said our overflow was shooting out the grease because the differential had been overfilled. We found he was right and everything was O.K. The shimmy was fixed and we were off at about 12:30 PM.

I was feeling better but still mighty low. We ate lunch at the Aneides locality north of San Antonio. By this time the sun had come out. At the end of the pavement we saw our first *S. rufidorsum*, a big fellow that looked exactly like *S. magister*. We did not obtain the animal. We did get two young ones and they are much different than *magister* though obviously closely related.

At San Vicente we obtained specimens of *S. orcutti* on exfoliating granite boulders. The road runs for about 25 miles over a monotonous marine terrace covered with *Agave*, wild roses, a variety of *Ribes*, and sundry other shrubs. This bench is about 5 or 6 miles in width and ends on the sea edge in an abrupt cliff and on the other side at the base of a similar higher terrace. There are four such steps before the main block of the Sierra San Pedro Martir is reached. The first two appear to be of marine origin and probably rise a total of 500 ft. above sea level. Stream beds

dissect this bench at various places in their course to the sea. The road drops down from a rise, crosses the stream bed of the Rio San Antonio and comes to the cultivated plain of the Hamilton Ranch. Corn and beans seem to be the principal crops. The adobe houses here are neat and for the most part, plastered.

We bought gas here (32 cents per gallon). I asked for “diez y cinco litros (5 gallons) de gasolina” (“quinze” would have been better). The Mexican (a pachuco type) said “How many gallons do you want?” I nearly asked him “Hable usted español?” We drove down a dusty dirt road to the Hamilton Ranch, which is a series of adobe buildings set on a small hill. There seems to be considerable water here, judging from the agriculture. I would estimate that 500 acres are under cultivation.

We drove over a rise and dropped down onto the San Quentin plain. It resembles the other part of the coastal terrace closely except that it is fringed on the sea by 4 hills that look volcanic (look like old cinder cones). The road to the Muelle San Quentin (wharf) is a good, fairly high center, sandy road. A three-mile drive brings you to the wharf, a series of pilings going out into the shallow bay. A peninsula, on which the cinder cones lie, forms the other side of this north end of the bay. Some very scraggly pines and eucalyptus stand along the bay, probably planted by the British colony that once occupied the plain.

Salicornia and rushes line the bay in places and in others abrupt cliffs drop to the water's edge. Cliff swallows are nesting in these cliffs. Egrets? were seen roosting in one of the pines. These birds certainly have a Jurassic look when they fly, with their necks crooked and their long legs stretched out behind. The weather is cool and breezy. The stars show through the cloud cover in places. I have had a time trying to rearrange our tremendous load so that we can get at everything where we want it (which is impossible). I look at the load and then Lowe asks me where the folding table is. I quietly crush his skull in the car door and then swim out to the sea as far as I can and sink.

We had a good weiner dinner and a nice eucalyptus fire. I now commence color notes on my specimens.

June 15, 1949

Barranca Rosario, Baja California

We slept late at San Quentin after getting up at 0800 AM. We ate breakfast, packed and started on our way.

The first moment after starting we met a car from ____ that was stuck in the sand. We pulled them out with 4x low.

About a mile further, we stopped in a patch of *Simmondsia* scrub and collected *Cnemidophorus hyperythus beldingi* and *Sceloporus rufidorsum*.

The road degenerates rapidly. It becomes deeply rutted and must be very bad during wet weather. The road is so bad that we made only a little over 4 miles today most of it in second gear at about 10 mph. This road has never felt the sweet caress of a road blade.

The flora is predominantly *Agave*, *Sedum*, and some chaparral elements. Arlene spotted a nice *C. ruber* under an agave. We drove on to Socorro (along the sea coast) where we ate lunch and had a can of warm Tecate beer. I became uncontrollably drunk.

01:30 PM. We drove off over a much dissected coastal plain. The road was very bad and we were only able to travel 10-15 mph. The vegetation is definitely xeric here. Finally the last semblance of a coastal plain is gone and we turned up a large arroyo and then dropped down a canyon to the town of El Rosario.

04:00 PM. It is the first really Mexican village we have seen. The houses are all adobe or mud and wattle and many have thatched roofs. The pueblo is strung along the north side of

an arroyo (about ½ mile in width). There are fig trees, cottonwoods, and some sort of locust tree. It is “muy bonita.” The street is a wide, aimless dirt street with various “perros” lying on it. The arroyo bottom contains a stream of sorts hidden by cottonwoods and willows. Much of the bottom is cultivated and planted with corn, lima beans, and alfalfa.

At the store we met a distinguished gentleman with a brilliant smile which showed 6 or 7 solid gold teeth. He looked to be the Jefe Politico. He immediately took us in hand and told us the names of all sorts of objects and arranged with some niños to have them hunt “culebras y viboras” for us. We offered 1 peso for culebras (muerto) o 1 peso y veinte cinco centavos por culebras (vive). He was most accomodating and spoke slowly. Chuck was trying to say “San Ignacio is far away (muy lejos) and he said muy huevos (eggs), muy vacas (cows), and about 6 other things—all wrong. The fellow thought this was most amusing. We all had a big laugh. He then accosted some small girls and asked them if they would like to hunt snakes.

The little girls acted very shy, giggled, and put their fingers in their mouths. This he took as a huge joke. Chuck asked them to hunt snakes and so it went—big laugh for everyone. We left and promised to return next morning for our snakes.

We drove up the creek, stopping at an old adobe ruin that might have been a mission. It sits up on a bank on the north side of the arroyo. We made camp just east of this ruin (1 mile). 3 small boys came into camp and we accosted them and offered our price for snakes. Shortly a battered *Thamnophis e. hammondi* was brought in. We paid our peso.

This stream is about the most southern stronghold of San Diegan elements, both of fauna and flora. In fact it is an island separated from the north by *Agave-Simmondsia* association. Nelson lists this river as the “Rosario River.”

The first *Pachycereus pringleii* was seen on the north end of the San Quentin Plain.

The weather has been cloudy and cool. At present there is a breeze. A large cloud bank is passing over the sky to the northwest. Collecting has been slow as a result.

June 16, 1949

5.1 miles E. of San Augustin, Baja California

07:50 AM. Arose. A thick fog covered the sky. We left our camp and journeyed into town. There we met our friend with the resplendent smile. He took us to the Escuela and presented us with our sack containing 5 *Thamnophis e. hammondi*, 4 dead and 1 alive. Chuck and Arlene paid him for them while I became involved with a drunken fellow who claimed to be the village surgeon and psychiatrist. Of all the things Rosario needs I think a psychiatrist is the least useful. The place is so peaceful and everything seems to move at such a slow tempo that neurosis would seem to be absent. The gentleman with the gold teeth (I think he is a teacher in the Escuela) showed this attitude by the way he used the dictionary. He took about 10 minutes to look up a word—stopping every once in a while to explain ones that caught his eye. The teacher paid the little girls who caught the snakes, giving them some sort of paternal advice and demanding their records (a piece of paper with each snake listed and its price).

I finally got away from the drunk, who claimed to have been educated at Stanford, Mexico City, and Paris. He was apparently in ill repute with his townsfolk as we had been waived away from his store by a caballero when we came into town the first time.

We left town after giving the teacher some cigarettes.

We drove up a very dusty and rutted road along the Rio Rosario. After 4 or 5 miles of this we turned south in a large, dry arroyo that empties into the Rio Rosario. *Agave*, *Opuntia*, *Pachycereus*, *Idria*, *Viznaga*, and much buckwheat and chaparral elements, formed the vegetation. The first Cirio was seen about 8 miles from Rosario, along the rocky slopes that

bound the Arroyo. About here I shot a leopard lizard that is very different from our California animal. Its blotchings have been replaced by fine punctuations.

Cirios now occupy the whole arroyo bottom in great profusion. The arroyo had been trending southward. It now turned east. At this turn we came upon *Salvia apiana* and *Acacia gregii*. The vegetation is decidedly ecotonal, being a mixture of chaparral elements and Colorado desert forms. In this area we shot *Uta stansburiana stejnegeri*. Many miles east, just past San Fernando we caught a *Phrynosoma cornutum*. This represents an overlap of coastal and desert faunal elements of about 35 miles. It is probably much more in some cases, as we took *Sceloporus rufidorsum* 3 miles east of San Augustin. This is an overlap of about 50 miles.

The road grew worse, becoming rocky. The road traverses rocky hills with a few small valleys interspersed. 34 miles from Rosario the road drops down over a rocky hill to a small valley in which the Rancho de la Arenosa is located. A small field of corn and a puebla that looks like a sub delegacion building make up the ranch.

Just east of the ranch we saw our first *Larrea*, and *Yucca mohavensis* made its appearance. The road became much better, probably due to less rainfall. After a rain the road is churned up and hardens in a very lumpy state. The country becomes less rolling and is dominated by mesas with steep cliffs. Anticlinal folding was noted along one of these faces.

We reached San Fernando, a small puebla in the San Fernando Arroyo. Few people now occupy this once populous site. A mission with elaborate irrigation canals once occupied the area (Nelson).

This puebla is about 15 miles W. of San Augustin. We traveled up this wash and dropped over onto Llano de Buenos Aires, a slowly undulating desert plain encircled by separated mesas. *Larrea* and *Yucca mohavensis* are the chief plants. Arios and Cardon Grandis (*Pachycereus*) occur only on the slopes of the mesas.

We reached San Augustin about 4:20 PM. It is a ranch sporting two windmills, set on the bank of a mesquite covered wash. The houses are adobe and thatch. The fences have been constructed of ocotillo limbs with the spines removed. Here we met two traveling salesmen who had just come from Cabo San Lucas. To them all the roads were "bueno" even though they had had two blow-outs from running over rocks.

They said the Laguna Seca Chapala was good snake territory. We may reach there tomorrow after El Marmol. We were informed we could get plenty of gas at El Arco.

We drove on and camped in a shallow arroyo alongside a mesquite. Arlene cooked a wonderful dinner of roast beef and mashed potatoes (fried onions) with coffee and pineapple for dessert.

June 17, 1949

Camp Aching Duff, 8 or 10 miles north of Laguna Seca Chapala

7:30 AM. Arose and ate breakfast (1 teaspoon of Grapenuts and ½ pint of water) (the Lowes apparently don't normally eat breakfast).

We drove over Llano Buenos Aires to El Marmol. At this mine there are 25 houses (wooden). There is a small airstrip with a tattered windsock to the west of town. The graveyard is beset with the usual Mexican paper flowers and large crosses. Instead of digging graves in the rocky soil, stones have been heaped over the graves.

Onyx (El Marmol) is being mined in open pit workings on a knoll south of the village. 3 large guy poles with block and tackle are standing alongside the pits. Large blocks are cut from the horizontal beds and hauled out of the pit onto a bank where they are numbered and cleaned for shipment. A man with a sledge and another with a chisel and brush clean the blocks. Their

rhythm is amazing. The sledge hits the chisel in a regular rhythm. After each blow the chisel is moved and the block swept with an agave fiber brush. The onyx is yellowish and quite hard.

We drove over a rocky hill and shortly came to a rolling plain covered with huge, exfoliating granite boulders. Cirios were very abundant and large. Cardon Grande was also common as was a small cactus species (*Pachycormus*?)

We collected *Callisaurus* in the washes. *Streptosaurus mearnsi* and *Urosaurus ornatus* were taken on the boulders. *Sceloporus orcutti* was seen but not taken.

The light colored *Callisaurus* with its high temperature requirement seems colored for protection while in the sun, where it spends most of its time.

Streptosaurus mearnsi and *S. orcutti* and *Urosaurus ornatus* are all dark and seem protectively colored for the time they spend in the shade. All have low temperature requirements and spend considerable time in the shade.

We drove on, shortly seeing our first elephant trees. They are unusual trees with knobby obese trunks, few small branches or leaves, and often parasitised by dodder. Their flowers are very small and numerous and are pink in color.

It is impossible to adequately describe this lush desert with much success. It gave me the impression of driving through a surrealistic world. The cirios are straight and tall often branching into 2, 3, or 4 smaller branches at the top and sometimes curving in a wide arc until their tips touch the ground.

The road was very good all the way through this granite area, being of sandy granite gravel.

We ate lunch in a grotto set in a huge granite boulder. We then drove toward Catavina. 2 miles north of Catavina we came upon some Blue Palms in an Arroyo. A single *Rhus laurina* was present. Mesquite, Willow, Idria, Agave, Ocotillo, Juncus, Cordon Grande, and rushes made up the rest of the flora.

I walked up the Arroyo toward some palms I had seen around the bend and shortly came upon a pool filled with rushes.

I set up a call "*Hyla*"—Chuck was up in a moment and we waded in the cool water (22.6 degrees C.) up to our waists. There were many *Hyla regilla* and some *Hyla arenicolor* (a dark little form). The wash was welcome.

This population is apparently the only one in the canyon. It is certainly very small as the pool is about 40 feet long by 10 feet wide and 4 feet deep at the deepest.

We drove on to Catavina—a cluster of 3 or 4 adobes set on the side of a vertical bank. In the Arroyo are several hundred blue palms. Some lush grape vines are growing on a shelf along the Arroyo. Large Mesquites provide shade for the Rancho. It is a picturesque and beautiful place but looks quite unproductive.

From here on the road grew worse and worse until it became one long steep rutted field of boulders and sharp rocks. We passed Rancho Jaraguay, a small adobe. The people were eating on a large table set on the veranda. An old bearded (white) Mexican told us the name. We drove on, now in 4-wheel drive up an excessively steep, rocky road. We drove on, circumnavigating a huge lava flow of some 300-400 feet in height and 10 miles in length.

The road remained very poor with occasional good stretches until camp was reached along the road overlooking Laguna Seca Chapala. A good dinner of tuna, noodles, and mushroom soup, coffee, and peaches was whipped up by Arlene and coughed down by one and all.

The terrain this side of Rancho Caraguay was very poor and sterile. Desert pavement covered with depauperate *Larrea-Franseria* scrub was about all that could be seen.

June 18, 1949

Mouth of Arroyo Escondido, Baja California del Norte

Left Camp Aching Duff at about 9:00 AM. We then drove down towards Laguna Seca Chapala.

About 2 miles north of the playa we passed the house of an indian fellow. He came out and spoke to us. His house was an airy one constructed of ocotillo poles set about 2 inches apart. What means of support this fellow has I could not see. He had a horse and a dog and all the desert he could use.

The road became much rutted and extremely dusty (about 2 feet deep of fine powder) as we approached the playa.

The playa itself is a nearly circular playa of hard mud. It is encircled on the east by granite mountains and on the west by abrupt lava flows. On the southwest edge some sand has accumulated. *Callisaurus* and *Cnemidophorus* were taken here. A Joshua tree made its first appearance.

Arroyo Escondido, at the sea

The road was badly rutted and dusty here also. Many snake tracks were seen, probably made during the night.

Chuck decided that all roads could be defined thus: very good—over 10 mph in high gear; good—high gear. Where he puts pavement I don't know—but it is of little importance to us now as we have the prospect of about 1,000 miles of dirt roads before reaching pavement again.

The road around Laguna Seca Chapala must be completely impassable in wet weather.

We drove on, up and over a rocky ridge on a fairly good road, whereupon we dropped into a basin of granite boulders, Cordon Grande in great numbers, Idria, Joshuas, *Larrea*, and Ocotillo, to mention the most conspicuous plants.

Santa Rosalia Bay

Chuck spotted a *Sauromalus* (Chuckwalla) on a large boulder. We tried every trick we knew to dislodge him, including fire, but we could not force him out. I saw two *Dipsosaurus* and shot another one. He is closely akin to the San Ignacio form with regard to his gular fold coloration. We drove on through a Cordon Grande forest and out onto a barren area of mud hills where we ate lunch in the shade of a lone Mesquite. The road was good here.

Further along the road we came to a concentration of Joshuas where we stopped. After a search I said "No hay *Xantusia* again." Just then Chuck said—"Xantusia!!" at the same instant I caught one and we were off turning boys?? like mad fools. We caught seven. They have yellow venters and show very little dorsal pattern.

Bahia Santa Rosalia, B.C.

I caught a nice *Hypsiglena* under a Joshua log. He may prove very interesting with regard to the so-called *Hypsiglena slevini*.

We pulled the Cactus spines out of our hands and drove on, passing through Cirio forests, Elephant Tree forests, and Joshua forests. At times they were all mixed with Cordon Grandes thrown in for good measure. The Elephant Trees prefer rocky slopes and at times there are real forests of them on these parched rocky desert mountains. They are so thick as to be almost impassable.

The effect of passing through these weird martian forests is indescribable. It is like no desert I have ever imagined.

Shortly we came to Punta Prieta (Black Point), named for a lava ridge that juts out southwest of the Pueblo. The town consists of about a dozen adobes, no cars, many mules and burros, a few “Cerveza Exquisita” signs (Carta Blanca Beer) and many ninos. We drove on and came to the Arroyo Escondido. The walls of this large arroyo become narrowed and form a water gap about 7 or 8 miles above the sea. Water is present through this gap in the form of long pools (50 yards by 30-40 feet wide) and slowly running streams. *Juncus* and *Salicornia* are abundant. We took *Hyla regilla* here.

The road passes over a jumble of metamorphic rocks through the gap; it then leaves Arroyo Escondido and goes close to the sea. Here we turned off and drove to the beach. A beautiful ½ mile long barrier beach lies at the mouth of this arroyo. On either side are cliffs of conglomerate and short reefs of rock.

We put on swimming suits. Chuck and Arlene were wading out into the shallow bay while I was looking at tide pools. Next thing I knew Arlene was looking very sad and wading toward shore. She had a gash on the bottom of her instep and was bleeding rather profusely. Chuck got the first aid kit while I helped her up the beach. The wind was blowing, it was past sunset, and quite cool. The sand was blowing so it was hard to keep Arlene’s foot clean. We made a basket carry and took her to the car.

She was in a good deal of pain. There was no way of telling whether she had stepped on a stingray or not. Arlene was in a semi state of shock. We treated the cut and put her to bed. She must have been in rather intense pain as she is not one to complain.

She was very much despondent about everything—mostly, I suspect, because she thought it might mean an end to the trip which had been going along so well.

Chuck too was despondent because of her pain and secondly for Arlene’s attitude. Both Chuck and I knew that she would be all right and determined to make a permanent camp here until Arlene was well enough for the rough travel that we know is ahead.

We put her in the tent so she could elevate her foot and be out of the wind.

Chuck and I ate a nearly silent supper that I had cooked up. Arlene still did not feel well enough to eat. She was very sick until about 1 AM when she went to sleep.

It was interesting to notice the accentuation of personalities at times like these. Arlene would never have had the attitude she developed had she been one of the scientists (god forbid) on this trip, even though she has already proved to be indispensable in many ways.

Chuck was at once in the depths of despair and wandered around aimlessly seeming not aware of what might be done.

I was also somewhat overroutted but somehow I don’t seem capable of the extremes of emotion reached by Chuck. I kept moving things around, often aimlessly, but did succeed in getting Arlene in the tent and getting dinner cooked and down Chuck.

I fixed only those specimens that demanded it and went to bed.

June 19, 1949

Bahia Santa Rosalia, Baja California

Awoke to find Arlene practically well. Her foot had not swollen to the extent it would have had she stepped on a ray. I think she got a deep cut from a shell.

We put up a shade tarp and I washed clothes and fished. I caught a big surf perch and an 8 or 9 pound spotfin croaker. I am mighty proud of the fish and he is the main course of our dinner.

During the excitement of last evening, I had forgotten to rinse out my air after soaping it in sea water with Fels-Naptha. The salt water turned the soap to scum and cemented my hair

into one solid mass. Arlene came up with a bottle of Halo Shampoo. The effects were amazing on both Chuck and I. What we thought was tan and long beards proved to be plain dirt.

I cooked the fish (in a high wind) and we had cranberry sauce, corn on the cob, fish, coffee, and peaches.

Some Mexican fishermen passed our camp to get water 1 mile up the Arroyo. Chuck told them we would buy snakes and shortly they returned with a much battered *Crotalus ruber*. They told us that La Paz was “muy lejo” and left with suspicious glances at us—no doubt wondering why we should pay two pesos for a dead rattlesnake.

We worked a while on specimens and drove the roads for a while, taking one *Sceloporus rufidorsum* at night and then returned down the road to San Xavier and camped about 2 miles beyond our last night's camp.

June 20, 1949

3.2 mi S. of El Arco, Baja California del Sur, Mexico

7:30. Arose, packed up and commenced driving toward San Xavier. The road skirts the ocean shore for a goodly distance, passing through dense *Salicornia* growth and sand. Many whale vertebrae and one jaw bone were seen. Arlene didn't quite believe the jaw bones to be those of a whale.

The road became somewhat poorer passing over ridges running to the sea cliffs and down into rocky barrancas.

Above San Xavier a fairly high range of mountains come down to the sea (2,000-3,000 feet). The road bypasses these by turning up an arroyo through a sparse forest of *Yucca valida*. All the plants here seem just on the edge of survival. We searched diligently but no *Xantusia* could be found.

Rhus laurina is present here and is about the most lush plant present in the area—*Yucca*, *Pachycereus*, stunted *Veatebia*, and *Idria* (very small) occur. This is apparently an ecotonal situation and it seems evident that most such populations are depauperate for all the forms present. This is probably due to each of the species being present on the fringes of its tolerance. *Rhus* is probably not on the fringe of its range here. Such situations as this one must obtain for the fauna also. *Xantusia* may not be present. The soil is very dry and there is no good cover it seems.

The road continues in a wash and drops down onto the coastal plains again. This plain is again a very much stunted *Yucca valida* forest. We took *Callisaurus* and *Sceloporus rufidorsum* here.

At the cutoff to Miller's Landing the road goes up and over a band of white coastal sand dunes. These dunes are covered with a succulent shrub and a few small *Yucca valida*. *Callisaurus d. crinita* is very abundant here. I took 5 in about 15 minutes.

The first arrival I saw I mistook for *Uma* even though I was very close. This animal certainly has paralleled the evolutionary trends of *Uma* and never seems to be found away from sand. Its body form, stance, locomotion, and pattern all approximate *Uma*.

We drove on, bypassing San Xavier, up and over a granite ridge and down into a flat sandy plain bordered on the south by a 400-500-foot-high lava flow. The plain is densely vegetated with *Larrea*, *Yucca valida*, *Pachycormus*, and *Prosopis*. We took *Xantusia* here under rotting Joshua logs.

They have quite yellowish venters and a pair of dorsal dark lines extending posteriorly from a pair of temporal lines.

We drove on toward the lava mountains and Mesquitiel Rancho. Just before treaching the Rancho we were hailed by a young Caballero who tried every trick known in Mexico to sell us some tanned hides he had tied to his saddle. One, he said, was “El Perro” (Quinze Pesos).

We passed through the main yard of the Rancho. It consists of 6 or 7 burros with pack frames, (kayaks), a rickety stable, and one adobe dwelling. At least 20 people (young and old) swarmed in and out of the house. I could see no other houses in the vicinity and I assume they all lived in this one house of 2 or 3 rooms at most.

We drove through with a “Buenas tardes” to everyone. The road curves down through the river bottom where it is very dusty and up along the edge of the lava mesa. The stream bottom must be quite full of water as the *Yucca* are very lush and large. They look more like our Mojave form when living in such a moist situation.

The road passes out onto the fringes of the Vizcaino desert. The desert is very densely vegetated. Large *Fouqueria peninsularis*, *Pachycereus pringlei*, *Larrea*, *Yucca valida*, and *Opuntia* of one sort and another cover the sandy floor. The road is very fine. Granite dust forms the whole soil and packs to make a smooth dustless road.

We drove up over a rocky ridge, dropped down into a deep barranca, climbed the other side and emerged into El Arco. This small village is composed of about a dozen adobes set at various places over a level dusty shelf about the size of a football field. There is no real street “per se”. The hills around the towns are very arid, rocky, and quite barren. They are dissected here and there by vertical walled barrancas. Some mine colliers and dumps line the closest barranca.

We asked a sober rotund little Mexican where we could get gas. He asked us for our Visitor’s permits. He was the Jefe oficial of the Sub delegacion de gobierno del Baja California del Norte. Since we were not given any at the border even after requesting them we were at a complete loss for a moment. I started to walk out to talk to Chuck when he hailed me back into the office. He had strapped a large web belt and revolver around his waist and was looking much more grave than before, nervously smoking a cigarette. Chuck suggested I get my collection permit, which I did. The little man had an assistant read it aloud while he paced back and forth looking grave. The signature of the General Forestal y Caza raised his eyebrows slightly though he tried to look as if we were all Calabozo-bound.

My picture on the permit showed me in a sport coat and tie with my hair combed. He looked curiously at me and pointed. He said “You” (Ustede). “Si, yo estoy muy sucio ahora,” I said. (I am very dirty now). He didn’t smile but had all the permits read to him, including how many animals I could catch and what to write to Mexico City after each trip. He asked me why we collected snakes and lizards. We told him for scientific purposes. He sneered and we left him to be important in El Arco (it must be hard at times). We drove to the 20 yard line alongside some gas drums and started to get gas.

The adobes here have dirt floors. Baby chicks and half grown turkey wandered in and out among the numerous ninos. Two women and an old man helped get the gas out of the drums by siphoning it with much laughter, spilling of gasoline, and wry looks.

We gave about 6 ninos some peppermint candy. Pancho, a little fellow of about 6, smiled from ear to ear. We learned that “oro” (gold) was mined here. The gas cost us 25 pesos for 10 gallons or about 30 cents per gallon.

We left and made camp south of the line (the del sur line is marked with white stones on a cleared space). We made camp amid Cordon Grandes and Ocotillos. A *Chilomeniscus*—crawled into camp and we caught a *Crotalus ruber* (red rattlesnake) crawling over the road.

Arlene was awakened by a huge centipede racing around her sleeping bag. I killed him. He must have been 8 inches long.

We worked over our specimens until about 12:30 AM and hit the sack amid many insects, one of which bit hell out of me. (Chuck told me to pick it up, which I did—it rammed a fang into my throat about an inch).

Big Joke: Back in El Arco Chuck referred to me as “El Nariz” (The Nose). All the Mexicans, particularly the two women burst into laughter. A boy of about 14 years who was helping me pour gas into the car, looked at me as if to say “You poor guy—I’d hate to be in your shoes now.” Maybe there are connotations to this we don’t understand.

June 21, 1949

San Ignacio, Baja California del Sur, Mexico

Arose and while Chuck pickled *Xantusia* and took color notes, I packed the truck. We drove on a fairly good road toward Los Angeles.

Los Angeles is a corral with a well. A caballero was raising water in the well (pozo) by pulling a rope (with his horse) attached to a leather bucket. The rope was run over a big iron pulley. From the length of the rope the water must have been down 100 feet or so.

Prior to our arrival in Los Angeles we had passed over a portion of the sandy part of the Vizcaino desert. I saw no dunes, the area being one of long low sand hills, vegetated occasionally by *Yucca* and *Opuntia*. *Callisaurus d. crinita* was very common here. I took 9 in about 20 minutes. Their whole demeanor again reminded me strikingly of *Uma*. Chuck saw two adult males who curled their tails before running. None of the some 20 or 30 chirrionera I have seen have done this.

The sand plain probably is quite extensive. The section we passed probably was 10 miles in length. We only crossed a tongue of it.

All day we could see the Sierra Vizcaino out over the plain. It is a most unique range apparently of volcanic origin, the peaks jut up vertically from long level saddles giving the mountains the appearance of a histogram. Joshuas continue to be quite common.

We camped for lunch under a Palo Verde. We stayed here, enjoyig the sparse shade for 2 or 3 hours. During part of this time I slept, being very tired after last night.

We drove on over increasingly rough territory on a rocky road. The terrain became a rocky undulating plain with occasional volcanic necks making conspicuous buttes on the landscape. The plain is dissected by deep vertical walled arroyos.

Copal trees are fairly abundant here. About 10 or 12 miles North of San Ignacio the road seems to have been worked on to a certain extent even though it is still very rocky. It has been cleared of all the larger rocks which have been piled at the sides of the road, thus you travel along in a ditch.

It was dark when Chuck called out and we stopped for our first *Crotalus enyo*, a nasty little fellow with a beautiful color and pattern. He lived among rocks (volcanic). The rocks are dark and the substrate is lighter in color. Ocotillo, poor Cordon Grande, Copal, and *Opuntia* made up his plant cover.

We drove into San Ignacio in the dark and stopped at La Tienda to make contact for snake collectors, which we did, then we drove east of town and camped in a clearing among the boulders. We were very tired but Chuck went off after a call that sounded like a toad but proved to be a bird. Every dog for miles was alerted and barking madly thus keeping us and every person for miles awake. When the neighborhood quieted we discovered a tarantula which may have left some of us a little uneasy about sleeping on the ground.

June 22, 1949

San Ignacio, Baja California del Sur

5:30. We arose early and started collecting. The daylight showed that San Ignacio is an oasis set in a barranca about 500 yards wide, bounded on either side by nearly vertical cliffs composed of jumbled blocks of volcanic rock. The vegetation on top of the banks of the barranca is sparse and arid (Copal trees, Ocotillo, Cordon Grande, and *Cereus* Cacti).

Along the south side of the barranca there is a stretch of water bordered by rushes. It runs for about 1 mile and is about 100-150 feet wide in places. It is variable in depth but must be 8 or 10 feet in some places.

The whole barranca is filled with date palms. Nelson estimated (in 1906) that there were 60,000 then. There are still that many and possibly more today. Broad dirt streets wind under the shade of tall date palms. Many of the houses are of date palm leaf construction and most have thatched roofs. Most of the substantial buildings are adobe though some are brick and the church is constructed of stones.

We crossed the water and drove up a side canyon looking for a way to get to the rock cliffs when we came upon the main section of town that we did not know existed. It was composed of winding and often narrow dirt streets. There is a large shady square in the center of town. The old church stands at one end of the square. It was built under the direction of Spanish missionaries in 1726. It is built of chipped and squared stone blocks about 8 inches on a side.

We entered the church, being guided by a young fellow who spoke English. (He was the village doctor—hired by the government.) The church is a very high domed one of three domes constructed of concentric rings of stone blocks. Candelabra hinge from the center of these domes. A large ornate gilt altar occupies one end of the church clear to the ceiling (40 feet). Several people were kneeling in prayer on wooden benches.

Arlene and I followed our guide up a narrow and steep stone staircase that ascends to the bell tower. It turns up one wall outside the church. There are four bronze bells in the tower. Arlene had attracted quite a retinue of “Lobos” who followed us making sly remarks in Spanish which neither of us understood.

We descended and drove around town. A quick-moving little man walked up to us with his arms waving. “Mira mi huerta”—He took us to his garden and told us how he had grown the grapes (uvas), figs, corn, peanuts, olives, etc. all in two years. I told him he was a good farmer and he told me how much work it was. Arlene and I asked him all sorts of questions. He told us he killed lizards because they ate the flowers off his melon vines. He gave us some peanuts (which we did not eat) and we left.

Arlene and I drove up the hill and picked up Chuck, who had been hunting lizards on the cliff. I got a *Petrosaurus* (see species account) and Chuck picked up 2 or 3 *Urosaurus* on palm trees and rocks.

We were told that San Ignacio has about 3,000 people.

We got water after an Indian had taken us on a long goose chase to the stream. At the stream we met our English-speaking friend. He was in great pain, having dislocated his shoulder while diving into the swimming hole. I drove him back to town and he told me what casa to visit to get agua. This I did. The house was a nice one with large airy rooms and cement floors. The family had a new ice box and several settees and nice chairs. The woman of the house said she had twenty-two children.

We drove down to the water to put up specimens. I drove the car up under a palm tree and we started to work. Children crowded around and Chuck set them to work hunting snakes. When the first one was paid off the rush began and we got six more and some *Hyla*. All the ninos began to gather around to watch us preserve specimens. Their interest in making money is very low, perhaps because they have no place to spend it. We told them they were “my perezozo” (lazy) and they all began to fall on the ground chanting “muy perezozo” to show how

lazy they *really* were. One jumped into the dense reeds that line the stream bank to show that he was *really* lazy. This demonstration went on for some time. We learned that there are tortugas (turtles) in the water but they are muy hondo (deep) during the day. This may be *Clemmys*. We offered 10 pesos for the first turtle. This brought no response at all.

We packed and left, driving over a reasonably good road to Santa Rosalia. We passed over plains and ridges, and mountains. The steep side of these mountains seems to be on the eastern scarp even though they did not seem to be fault-block mountains. We camped just back of the beach in a little draw long after dark.

June 23, 1949

Santa Rosalia, Baja California del Sur, Mexico

Arose and drove into town where I took my shoes in to be fixed, had a haphazard job of greasing done on the car, and sent a telegram home.

The town is set in the most arid of situations along the gulf coast. All the buildings are of wooden frame construction and are closely packed together. There is a sheet metal church and a square with some lush Indian Beech trees shading it and its cement benches and central pool.

Long wharves reach out into the bay, apparently constructed of slag from the processing plant. A 10,000 ton vessel is said to be afforded adequate depth.

A short, narrow gauge railway runs to the copper mines about 7 or 8 kilometers out of town. We saw two engines hauling ore cars. They had tall stacks like the DeWitt Clinton.

North of town near the base of a grade called La Cuesta de la Infierno a new manganese mine is in operation. The ore is said to be a surface deposit with a vein of black ore of considerable thickness. Dr. MacKinnon, a Scotch dentist, who owns a ranch near La Purissima gave us much of this information. He walked up to us while we were waiting for my shoes to be fixed. He was one of those people who have lived all over the world. He gave us the names of several people we would meet along the way. He asked us if we knew what an animal he had seen might be. He then drew a picture of a long lizard-like animal with only two legs, both springing from the sides of the animal's head. The description fits *Bipes* of course. He said they were common under rocks on his ranch near La Purissima. They never come out in the daytime he says but are always buried. The natives call them "Ocolotes" and apparently they are quite common.

He advised us against taking the road to Comondu as it is very bad. Instead he suggested that we go to La Purissima on a level road. This we shall do.

My shoes were fixed and we left, stopping for lunch at a mesquite tree in the middle of a wash. We ate and then I tried to drive out over the sand. The car bogged down on a hummock and before long we were really in the sand. The heavy load did not help so we unloaded it to the shade of the Mesquite tree. The day was terribly hot and humid. I had to stop working very often and every movement became a real effort. Chuck and I let a lot of air out of the tires (down to 15 lbs.) and even this did not work so we slept for a while under a mesquite. I was very much out of it and so was Chuck, though not as bad as I.

Finally a truck came down the road. I un— the block and tackle while Chuck hailed them and he pulled us out with no strain. We gave him some cigarettes and drove very slowly back to town to get air as it was only two miles and we were very tired and would thus save time and energy.

When we arrived at Santa Rosalia the town was fairly humming with activity. All the populace had come out in fresh clothes and were promenading up and down the streets. A cornet band was playing in the schoolhouse. These people are just like the lizards. They get up with

the dawn and work until it gets hot and then disappear from sight. When it becomes cooler they all appear again. Everything stops at dark (most everything).

We found only about 30 pounds pressure in the air hose and had to pump the rest in, surrounded by small boys. We drove out of town and ate dinner on a small playa south of town. We were all somewhat sick from the exertion and heat. We had sauerkraut and spare ribs and potatoes (out of a can) and coffee. It filled the bill but didn't taste like some of the other meals we have eaten. Chuck discovered that he had failed to load the shovel so we had to drive back to where we had been stuck. It seemed like we were unable to pry ourselves loose from the hot clutches of Santa Rosalia.

We drove on, through the night, through a village called San Bruno. It is located 15 miles S. of Santa Rosalia. Some Palms and white houses were all we could see. The ocean (Gulf of California) is close by as attested to by the presence of *Salicornia* marshes.

We drove on through washes, over cobblestones, and finally made camp under Palo Blancos (we saw them first just south of Santa Rosalia) and Palo Verdes. The Palo Blanco is a thin, graceful tree with a pure white bark. They are quite common in washes and near moist situations. The tree belongs to the family Leguminosae, as the bean pods hung from every tree, their yellow color and the white of the bark making a most interesting and beautiful combination.

Only in moist places did the trees show their pinnate leaves. These trees are no exception to the rule that all life retreats from the summer. They simply pull in their leaves and live inside a cool trunk.

June 24, 1949

Santa Rosalia, Baja California del Sur, Mexico

We pulled into camp at about 9:30 PM, all very weary and limp from the sun.

Mulege, Baja California del Sur, Mexico

Arose with spirits somewhat brighter, ate a feeble breakfast (as usual) and took off down the road. We travelled in a sandy valley between precipitous mountains of sandstone. About 5 or 6 miles south of camp we stopped by some boulders, amid Cordon Grandes and Ocotillos. Chuck picked off a small Chuckwalla and I got one shortly thereafter. They are the first to be taken from this part of the Peninsula. They are smaller and not very colorful as compared to our Mojave animals.

We drove on over this good road to Mulege. This town was anything but what we expected. I thought San Ignacio would be the nicest town we would see, but Mulege exceeded it by far. Upon entering town you drop down over a dusty rise onto a main street of adobe buildings, ___? in spots with pinks, blues, and other rather outlandish colors. Many of the windows are grated. The numbers of children are enormous in all of these Mexican towns. They must die off at a huge rate as there are not so many grownups in comparison.

The vegetation is one of the most remarkable things about Mulege. Mangos, Bananas, Grapes, and Palms are everywhere. The place is a veritable jungle of lush vegetation. Both Coconut and Date Palms are very numerous. A stream of fresh water about 60 feet wide flows through the center of the arroyo in which the town sits. (It is dammed to keep it from mixing with the salt water estuary that forms the mouth of the stream). Steep cliffs rise on both sides of the town

We drove through the town and out a little dirt lane shaded from the sweltering sun by Coconut Palms to the edge of an estuary lined on the water's edge with mangroves and on the other side by tall Palms and Grape vines. Fish jumped in the sea water; a group of small children

with bare feet padded down the dusty road carrying swimming suits and 3 or 4 small watermelons.

The road lead to a crescent barrier beach of white sand with the mainland on one limb and a rocky peak on the other, topped by a light house.

We were filthy from several days in the field with no baths, so we put on our suits and swam in the beautiful emerald water. It is quite warm water but not so warm as to be enervating. To be clean was about the best feeling that can be imagined. We rinsed off with fresh water and washed with Vel (a detergent works quite well in salt water where a soap is useless). We saw no sting rays (Manta) in the Gulf though I saw several in the estuary.

Back at the town we picked up water at the town fountain. We made camp along the stream. The ninos came in droves when we offered 25 centavos for a lizard. We got many nice ones this way. Chuck offered 5 pesos for snakes. An old Senora who had been listening perked up and went resolutely down the stream under the palms. About 15 minutes later she returned with a large gopher snake on the end of a stick (even the children will not hold reptiles by the body and come into camp holding lizards by the tips of their tails—why the tails don't break I do not understand). The five pesos had even brought out the old folk. The snake is much different from one form in Southern California. It is quite brilliantly colored with hennas and rich browns

A fellow who said he built houses sat down and talked to us—often too fast to be understood. He tried to bum a ride to Ensenada—what he intended to do about his senora and 5 ninos we never found out.

He told us of snakes (amarillo) in the palm trees and black ones in the palm trees. After this information he told us a snake story about a vibora (viper) and a cameleon (Horned lizard) with many gestures and much laughter. We did not understand it at all, but enjoyed it nevertheless.

After a confab I offered him a cup of coffee. Arlene was worried (along with Chuck and I) that he might carry amoeba on his hands or mouth as many Mexicans do—we decided to offer the coffee and boil the cup later. But the coffee was hot so he walked over and picked up another cup and poured the coffee back and forth—soda jerk style—thus getting two of our cups out of commission. We were all laughing and he thought it was about the hot coffee so we all had a big laugh.

We left this town after getting gas and disappointing dozens of ninos who brought in lizards after we said “No mas chucorones”. The tide had come in and in places covered the road where it passed along the south edge of the estuary. At times we were driving along through the water 50 or 60 yards from the nearest land. The road borders the Bahia de la Concepcion down nearly its whole length. Beautiful beaches of pure white sand and clear green and blue water, bordered by rugged mountains covered with desert vegetation make this bay a most wonderful place. It became dark as we drove along. We stopped and cleaned all our dishes with sand and sea water. A little further, where the tide had covered the road we saw the dreaded trunk fish or Botete swimming on the road. They are chubby, square-headed fish with a pretty brown and white pattern.

The road then goes up a cliff that rises vertically above the bay. It is quite steep but good a good road (4 wheel drive necessary in many places).

Bahia de la Concepcion, Baja California Del Sur, Mexico

We drove on and camped in a little valley. Chuck was very tired and so was Arlene so they went to sleep while I took color notes on a couple of speaniers?? This night we put up our mosquito bars as malaria is present here.

June 25, 1949

La Purissima, Baja California del Sur, Mexico

We arose, considerably refreshed and drove along a good road that follows the bay! (Bahia Concepcion). Frigate birds circled in their weird, disjointed way and numerous flights of white-headed pelicans flapped and glided in single file over the bay. The road shown on the Automobile club map going south along the west end of the bay is now in disuse. The new road does not leave the bay when it reaches the south end of the bay but circles around the base of Bahia on a tidal flat. The road is quite good.

After it has passed clear past the south east corner of the Bahia it turns south past a small Rancho, climbs a rocky grade, and drops down to Rosarito. Rosarito is a rancho built of brick with trellises of morning glories. Mesquites and palms serve to give shade. Beautiful Palo Blancos fill the wash behind the Rancho. The cattle do not look very fat even if the rancho is pretty.

The road always goes through the main dooryard of all these places and everyone comes out to look when you drive through.

A little beyond Rosarito the road passes by a little white Casa set on the bank of our arroyo. There are numerous cattle, many mesquites, and palo blancos and palo verdes in the wash, and a few palms. An Italian lives there with his senora. He speaks English with a mixture of Spanish and Italian accents.

This rancho is called Campoli. From it the road branches. To the left is Loreto along the gulf coast and to the right is Comondu and La Purissima. We followed the latter branch and began to ascend a rough volcanic ridge. About 7 miles south of Campole we came to another fork and took the road to the right that leads to La Purissima.

This road is a winding one but smooth enough. The valley in which it runs is bound by vertical walls, capped by basaltic lava. There is a veritable forest of mesquite and opuntia. Clinging to the vertical walls are large, white-trunked trees of the fig family. The roots and various trunks run into cracks and over rock surfaces like tentacles. On the south Canyon wall, shaded from almost all sun we took 6 of the beautiful *Petrosaurus*. Their demeanor and body form at once places them as close relatives of our *Streptosaurus mearnsi*. Pinks, blues, yellows, olive greens, black and other colors are blended on this animal.

The weather was much, much cooler than it had been on the gulf slope. We felt able to move again and were once more civil to one another—except for Chuck who had gotten dust in his eye and who could not see. A little Murine did wonders for him however.

Before long the walls became higher and the lava cap turns in columnar forms. We saw palms and many lush mesquites. We stopped at a weather station (rain gauge, temperature, and humidity).

The Casa was called Ojo del Agua. A sizeable stream flows over rocks in the stream bottom. Several fords were made. The road runs, at times, over rocky shelves along the river bank. The walls are nearly vertical and perhaps 1,000 feet high, the lower segment being sandstone and the upper 300 feet being lava (Basalt). The stream is a clear, fairly swift-flowing stream backed up in various places to form pools of varying size up to 200 yards in length. Tules, willows, a tall bamboo-like grass, and mesquites border it. Where the canyon widens, groves of Date Palms, Olives, and Grapes are planted. All looked very healthy and green.

We drove up into a small village (50 or so adobes) of San Ysidro. Here we met a jolly truck driver who told us about the MacKinnon ranch we had intended to visit. It is on the southern edge of the Vizcaino Desert and consists of nothing but "Jack Rabbits and sagebrush. He has spent 12 million Pesos on it and now his water is coming salt from the well and all the trees are dying." The driver spoke English very well. He had lived in Los Angeles.

He likes MacKinnon but said he was full of “baloney”. “No matter how thin you slice it, it is still baloney,” he said.

We asked about Ajolotes. He said there were two kinds—a light one with “two hands” and a dark one. He asked all the village populace to hunt them for us.

We drove back upstream and camped near an abandoned shack alongside a sluice that carries drinking water to SanYsidro. We boiled water and filled our cans to the top. Even boiled it is good.

Chuck and I worked and boiled water while Arlene tied tags. We stayed up till 1:30 AM to get our back work out of the way. The air and breeze were like a drink of ice water on a hot day—cool and invigorating. We all felt good for the first time since San Ignacio.

June 26, 1949

Magdalena Plain, Baja California del Sur, Mexico

Arose early and were all sleepy. I washed and hung my clothes out on a mesquite tree as did Arlene and Chuck. The water is quite soft and the detergent worked well even in cold water.

While we worked several Mexicas came up. Some small girls brought in Zapos (toads) (*Bufo punctatus*) and water snakes for which they were paid. A Mexican fellow said he could show us Ajolotes. They were in his garden he said. We followed him down by the stream amid date palms, willows, and mesquites. Chuck and I were ripping apart a cottonwood or willow stump when we spied a beautiful skink with a blackish brown body with light gold stripes and a purple and red tail. He was pounced on before he could move. This, the Mexican said, was the black Ajolote. We had hoped for *Bipes* but apparently that was the other Ajolote.

A little diligent rock turning produced 3 more skinks, a Tuberculate gecko, and a worm snake. Chuck caught a King snake and a racer.

We drove into town and were rewarded with a box full of very battered lizards caught by a small boy. He was apparently the only hunter around. We left formaldehyde and instructions with one fellow in hopes of getting *Bipes*.

La Purissima is about a mile down the canyon from San Ysidro. The town is full of adobe ruins and is in general very dilapidated. Mexican women peer out on the street from behind tattered plaited palm frond mats. A rectangular square encircled with stone benches occupies the center of town. We bought 5 gallons of gas and left.

The road passes up and onto the plain above the Purissima. Instead of lush vegetation and water all is now ocotillo, Cordon Grande, and cactus set among lava boulders. The road is quite good, having bridges of stone here and there. Before long we could see the ocean far out over the undulating plain to the west. To the east nearly hidden, are the tips of the ranges in the Sierra Giganta.

Very occasionally *Yucca valida* clumps are encountered among the *Ocotillo peninsularis* and Cordon Grande. *Larrea* is occasionally common and sometimes lush. Low, rocky hills alternate with wide sandy areas. Epiphytes and Orchilla (a pedulous lichen once used in the dye industry) are very common on Ocotillo, making them appear to have thick trunks and limbs. We took (Chuck did) *Xantusia* and *Phylodactylus* here under *Yucca* logs.

We drove on, long after dark and made camp under a big Mesquite tree. I have a nice fire at my back to ward off the cool night air (18 degrees C.)

Spanish names for lizards:

Callisaurus—Cachimba

Sceloporus—Carnarro

Skink—Ajolote

Bipes—Lolcuatl

Dipsosaurus—Cacharon or Iguana
Cnemidophorus hyperythrus—Guico
Small turtle—Cahuama

June 27, 1949

Magdalena Plain, South of El Refugio about 6 miles, Baja California, Mexico

7:00 AM. Arose after a good night's sleep and worked on specimens until about 1:00 PM, getting everything caught up to date. We started to drive over the monotonous Magdalena Plain. To the east the rugged summits of the Sierra Giganta could be seen. All around us was an undulating sea of scrawny Cordon Grandes, Ocotillo (covered with Orchilla) and epiphytes (Toje in Mexican) that seem to be a xerophytic bromeliad, various opuntias, Cereus cacti, and mesquites. None of the plants are lush.

We came to the Arroyo Santo Domingo where we drove to the most prosperous Casa, belonging to Don Santos Castro. We had been referred to him by Dr. MacKinnon at Santa Rosalia. We asked about roads into the Sierra Giganta. He said there were only mule trails. This was disappointing as we had hoped to collect there. He knew about Ajolotes and said he could get them for us.

He led us to his huerta. It was a fine farm of corn, grapes, figs (*Higuierras* sp?), and beans. He had a deep well with about an eight-inch pipe.

A large engine about the size of a caterpillar tractor pumped beautiful cold clear water out at a great rate. Part of the well shaft had been dug by hand and was shored up with mesquite logs. The engine was set in a dirt cellar about 10 feet below the soil surface, shaded by a thatched roof. The engine was obviously his pride and joy.

We dug for *Bipes* but did not find any (see Species Acct.). We left him a jar to be picked up on our way back.

On down the road we went. The day was beautifully clear and cool. It is amazing to me to find this plain so cool. Palm Springs is probably 120 degrees now. I doubt that it was over 80 degrees F. today here. The nights are so cool that the sleeping bag is most welcome whereas we slept outside at Santa Rosalia and Mulege.

The plain is an alternation of small playas practically devoid of plants and higher areas of poor cordon, ocotillo, and mesquite. We only took 3 lizards. A good dinner was eaten just at dusk and we drove on past El Refugio. We saw only one snake but he made up for the paucity by being a beautiful boa (*Lichanura trivirgata*). Chuck was elated for hours over getting him. He is a beautiful animal with 3 longitudinal dark brown lines alternating with gold tan areas. His venter is flecked with brown.

We made camp under an Orchilla-covered Mesquite and I skinned a vulture (King) (caracara) that I had shot.

Weather stations were seen at San Domingo (in the care of Don Santos Castro) Pozo Grande, Buena Vista Rancho. Instruments include thermometer, pluviometers (rain gauge), and wind gauge.

The vulture turned out quite badly as he proved to be full of lice which crawled all over both Chuck and me before we realized what was tickling us. I tossed the skin (which was nearly done) as far as I could throw it and fell to powdering myself with some rotenone that Chuck had brought along. Chuck did the same. That night my air mattress collapsed and I found myself sleeping on the largest and lumpiest cow pie ever constructed.

Finally, after some shifting, we got situated and slept.

June 28, 1949

I woke early in the morning and the sky was clouded over completely. It was cool enough to have the sleeping bag zipped all the way.

Chuck and I did some collecting in the Cordon Grande-Ocotillo scrub. We shot *Cnemidophorus t. rubidus*, a very distinctive whiptail lizard with a rose colored gular fold, hind legs, and tail.

52.1 mi S. Medano, Magdalena Plain, Baja California del Sur, Mexico

We also picked up a new subspecies of orange-throated race runner and the blotchless *Uta*.

The general aspect of the plain is of stunted vegetation, thickly covered with lichens. All in all it is rather dreary. The road, however, was good for about 30 miles below Medano. In places it is quite sandy and after a while is rutted and washboardy, making for uncomfortable riding. However, nothing can dampen the fact that *we are on the Magdalena Plain*. The names of these places we are seeing were, only a short while ago, only fabled places on a map, to be dreamed about. To be one day north of La Paz makes up for most everything.

We can see Santa Margarita Island poking its summit above the horizon even though the ocean is not visible. It is the highest peak in the area.

The ride was punctuated only occasionally by dips into vegetated arroyos or brief passages through rickety pueblos. The rest of the day was all Ocotillo, lichens, and dust.

At dusk I rode on the front fender while we hunted Poor Wills. Night hawks swooped in every direction in front of us. The abilities of flight shown by this bird are amazing. We got no poor wills but I was tossed off the fender when Chuck stopped quickly for one we did not see until the car was almost upon it. I hit the road running a 9.3 100 yard dash and succeeded in not falling down. Shortly we came to the beach. The road, a very sandy one, running along behind the beach dunes.

8:30 PM. It was several miles before we found a stretch of sand large enough to camp on. I built a rather smoky but warm fire and Chuck brewed a pot of coffee.

Several times today we have seen vultures of the type I shot—sides of head white, ruff of black feathers on back of head, large white beak with pinkish skin around it, body brown, wings brown with white bar at tip, tail is banded at tip with brown, white with brown lines across is on the rest of the tail (Caracara).

Also we have been seeing a bird (Harris Hawk) that looks like a marsh hawk except that he is very dark and has rufous on his back. His rump is white and so is the bar of his tail. The tail is long and thin and the wings broad (Buteonid wings)

June 29, 1949

On Road to Rodriguez, above La Paz, Baja California del Sur, Mexico

8:30 AM. Just away from our camp, about 200 yards, was the beach line. The beach was steep and waves pounded in on the sand. The effect was wild. The sea crashing and spurting up over a headland to the south. Once more underway we continued driving through the same sort of scrub we had seen for two days. At Arroyo Seco the road dips down and passes the abandoned village. From here the road turns inland through the same sort of territory. We collected an additional leopard lizard and picked up several horned lizards. Short walks netted us a good many species.

The road traverses rolling plains country vegetated very heavily by almost pure stands composed of three plants: Cordon Grande, Ocotillo, and Joshua Trees. Joshua trees became more abundant during the day's travel though they never became verdant. The fallen logs were

never large enough to supply adequate shelter for *Xantusia* during the heat of the day. We searched diligently but could turn up none.

The effect of the sea coast was modifying in the extreme as we soon told when the heat closed around us as we drove inland. It felt like Chicago in the summer and before long we were all (all except Chuck) running with perspiration. Chuck never seems to get hot.

The road now passed up and into the southernmost foothills of the Sierra Giganta. These consist of an arroyo dissected bench covered with an arid tropical jungle so thick as to be almost impenetrable.

North side of La Paz Bay, Baja California del Sur, Mexico

Most of the plants are new to me. A new tree with a thick white trunk and dark green palmate leaves has become common. Bromeliads and various Euphorbs have made an appearance. The *Larrea* (creosote) has to stretch its neck to see over the jungle and thus has become tall and spindly. Most of the plants have thorns of some sort and all are adapted to extreme heat in one way or another.

Suddenly, out of this impenetrable sea, we saw ocean and an island. The ocean was La Paz bay and the island Espiritu Santo Island. We soon could see La Paz set at the edge of the bay at the base of tall rocky mountains. About ½ of the bay is cut off into a tidal lagoon by a long spit of land extending from La Paz northward across the bay. We could see that the Giganta ends abruptly at the edge of the La Paz plain as the edge of a mesa. The road cuts down over this steep slope and out onto the Plain. This plain is very low and slightly humpbacked, sloping into the sea on both sides. It is easy to see that very little shift in elevation (either of the sea or land) could inundate it and leave the Cape region an island.

The Sierra Victoria are quite precipitous and remind me of our own Sierra Madres.

The plain is a dense forest of Giant Cactus, mesquite, Ocotillo, and *Larrea*.

We drove up a road leading to Rodriguez and camped by the road. Arlene whipped up a good dinner of tuna and rice and beets and coffee.

I burned my hand rescuing the Coleman lamp from falling and Chuck spilled ink on his journal. A jolly time was had by all.

June 30, 1949

La Paz, Baja California del Sur, Mexico

The road circles the tidal lagoon and before long we came to the outskirts of La Paz. Things look more prosperous here, the buildings are less often of scraps and more often adobe painted various bright calsonine colors.

The road enters town along the waterfront. This is a beautiful place. It is a semi-circular cement walk lined with benches and shaded by coconut palms on the ocean edge. A bandstand occupies the center of the promenade. On the shore side are huge Indian Laurel trees, so dense that no sun penetrates their canopy. Hotel Perla and several impressive government buildings occupy the waterfront. A small steamer dock juts out into the blue bay from the bandstand. A coastal trader was unloading flour and grain from ports along the Sonoran and Sinaloa coast. The bags were labelled "Yaqui". Over cobblestone streets to the center of town we went passing on the way, many houses with the iron-barred windows so typical of the tropics. The central square has the usual benches and the usual bronze bust of some unknown individual in the center.

Chuck and Arlene and I went over to a place called "The Aloha Bar" where we picked up much Carta Blanca (Cerveza Exquisita). We then retired to the waterfront, had ginger snaps, cerveza, roast beef (canned) and brown bread (canned)—a delightful repast. Later we had some

more money changed at Rufo's (the largest department store in town—a whole block) and picked up the car which we were having serviced.

We bought gas and during the heat of the day proceeded out of town on the Todos Santos Rd. to cook dinner. This we did.

Arlene, apparently feeling slighted about our visit to La Paz and no doubt tired gave us more than a few anxious moments by turning on the "female attitude" amid tears and such. Since we had intended to go back into town after dinner and see what we could see neither Chuck nor I knew exactly where to start. At this stage in the trip such goings on left us a little low when we think of the trip back in which there are no new places to see—just jouncing dirt road travel and collecting.

However, Chuck handled things with more diplomacy than I have ever seen him use before—much more than I was able to muster. We went back to town and walked down the waterfront at sunset—a beautiful sight—a shimmering bay, a row of palms silhouetted against a fading orange sky. There is no traffic here and a cool sea breeze moderated the heat of the day leaving everything cool and beautiful.

We walked up town looking for music and found only juke boxes with Spanish _____ music blaring out. "Mi pobre Corazon"—finally, at the Aloha Bar we spotted a neat, rather aristocratic Mexican, with a guitar. He finally came over and sang several songs for us (mostly for Arlene I suspect). Unfortunately he had a rather drunk friend who informed us numerous times that he was a 26 year old First Lieutenant in the Air Force. We left the music as a "hot jazz band" straight from Vera Cruz had begun to play. Mexicans that looked like farmers began to play saxaphones and stand up and give out with various hotnotes. We decided to see Danny Kaye in *The Secret Life of Walter Mitty* (with Mexican subtitles). We bought loges (for 25 cents Ameican) and walked in. It was about 30 minutes beore I realized that there was no roof over us. The moon and stars were not painted on. The loges consisted of wooden benches on the level. The other seats were bleachers. The words were not transmitted very clearly which didn't disturb any one but us. We walked to the car and drove out of town and camped along the Todos Santos Road.

July 1, 1949

Todos Santos, Mexico (Baja California)

I awoke early to see 2 Caballeros driving cattle down the wash in which Arlene was sleeping. The men herded the running cows past her sleeping bag much to close for mine and surely much closer for her comfort.

We drove on toward Todos Santos, collecting many lizards on the way. Chuck noticed a large head jutting from the top of a Gant Cactus (Cordon Grande). The animal proved to be a *Ctenosaura* or Giant Spring-tailed Iguana. The lizard ran down the trunk and disapeared behind it. We found him in a hollowed out nest about 20 feet off the ground. The lizard was about 2 feet long, heavy bodied, and with a large crest of elongate scales along his dorsum. Another was shot in a similar situation later in the day.

The Sierra Laguna loomed on the horizon all day, waiting to be invaded by its first crew of herpetologists. In profile it reminds me of the Sierra San Pedro Martir, with a high peak at its northern end, isolated from the main mass. The scarp is on the west side and is quite precipitous. The mountains appear to slope off to the south.

We rounded these mountains and proceeded down the Pacific side over rolling, ravined foothills until we dropped into a barranca in which some small farms were located. On the south side of this arroyo is the pleasant little town of Todos Santos. It is a quiet little place of dusty streets, bright calsonuned adobes, and shady trees. It gave me the impression of being clean.

A pretty little square (as in all Mexican towns) occupies the center of town. It is encircled with shade trees and benches and has a fountain in the center. Aztec paintings are seen on the walls and benches.

A very old looking church with 3 green bells in its tower for 6 is situated on the south side of the square. A theater and store are on the west and a cantina forms part of the east wall. Just to the west of the church is a bluff. I stood looking over the arroyo below. It is a mass of greenery. Little square farms lined with coconut and date palms make up the greater part of the valley, which is ½ mile across at its mouth. Beyond is a bright blue bay.

We located Manuel Santana, to whom we had sent a telegram asking for burros (mulas) to pack into the Sierra Laguna. He was a fine quiet gentleman and had relayed our message to Tinio Castillo, a packer who guides people into Laguna, a small lake in these mountains. We bought the food recommended by Sr. Santana and proceeded toward La Burrerra. This latter place is the pack station for trips to Laguna.

Somehow we took the wrong turn and ended up near Rancho Santo Domingo, described as “muy lejos” from La Burrerra by a caballero we interrogated. It proved to be about 20 miles by road and 5 as the crow flies. The vegetation in the foothills is remarkable. It is a mixture of all sorts of legumes, bouganvillea, Elephant trees, cacti, all living together forming a forest 20 or 30 feet in height. There is not much shade but so much vegetation as to keep the air still and so it was very hot. We ate dinner at sunset in this beautiful forest, not enjoying it as we should have perhaps, because we were so far from our destination. We drove until about 11:00 PM and camped in a wash on a lonely road over which no one passed during our visit. The three of us were so tired we went to bed without tagging our animals.

We had taken our first Cape Rattlesnake (*Crotalus ruber lucasensis*), a big but skinny fellow.

July 2, 1949

La Burrerra, Baja California del Sur, Mexico

When the dawn broke we were up—not a bit too soon as we worked until 11:00 AM getting our specimens up to date and the car packed. We drove up the road (a fairly good one) through the same foothill forest we had visited yesterday until we came to La Burrerra, a very ramshackle house of sticks and mud with a thatched roof. It is set in a little draw off a larger arroyo. A permanent stream flows down this draw. The girls here brought us several *Bufo punctatus* amid all sorts of screams and giggles.

The price for 3 pack mules, 2 guides, and 3 riding animals was set at 126 pesos or about 15 dollars American for a four day pack trip. We supplied the food for the guides. (Sugar in little brown moulds) 2 kilos, Rice (arroz) (1 Kilogram), Onions (1 Kilo) and Frijoles (2 Kilos), Coffee (2 kilos unroasted). We found that the most important item, harina, had been forgotten. It is the basis of making tortillas which are the staple food for these people. After many rueful looks (we offered him cornmeal and pancake flour) he said he could get it at his house. I took a walk with Chuck, up the little stream that flows back of La Burrerra. It flows in a steep-walled twisting granite canyon. Water snakes are said to occur here. The habitat is such that many chapparal elements might find niches. We saw *Petrosaurus*.

In the evening Chuck and Arlene and I piled up the equipment we wanted to take to Laguna. For three pack mules it wasn't very much.

July 3, 1949

La Burrerra, Baja California, Mexico

Chuck told Senor Castillo we would see him “muy temprano” (very early). We worked until quite late on specimens and notes and then hit the sack in the stream bed where the car was parked, which proved to be a gathering spot for all the stock.

La Laguna, Baja California, Mexico

With the first greying of the dawn (about 5:00 AM) I awoke to the sound of women's voices. It was the Mexican girls getting water. I got up and walked up to the Casa where I met Senor Castillo. After showing him the gear I walked down to the creek bed and found Chuck and Arlene dressing. We had all had 5 hours sleep that night.

We walked to the car and Senor Castillo brought the mules down. They are small animals compared to the mules I have seen in E.V.A. As all packers do he sort of sneered at the items we wished to pack. Though the pile was small he objected to our water cans. We ignored his protests as well as possible, but still he had the upper hand and we were merely a crew of ignorant turistas carrying a lot of frivolous equipment. I have received the same treatment in our own Sierra Nevadas. I guess it is to be expected.

The pack mules each have what looks like a leather saddle bag packed with straw as a pad. These are called aparejas. They are all handstitched with leather. Very little manilla or hemp rope was in evidence. In place of these were horsehair ropes and braided and twisted rawhide ropes. The cinches were of horsehair.

We had two packers: Senor Tino Castillo and Antonio Salvatierra (22 years old). Sr. Castillo is a man about 45 years old and as lean and tough as his mules. On our trip he wore a felt hat (much battered), dungarees (much battered and patched), and sandals over his horny feet. These sandals are an ingenious contribution of the machine age. They are pieces of truck tires attached to his feet by leather thongs.

When all was lashed down we were given three saddle mules. Antonio rode a horse without a saddle using only a halter rope and sitting on a pad of blankets. Sr. Castillo was on foot.

La Laguna, Sierra Victoria, Baja California del Sur, Mexico

7:00 AM. Off we went, down the trail leading up the Arroyo. I purposely slipped into last place and had the supreme satisfaction of watching the pack train wind along the trail in front of me. The sun was not yet hot. Many 30 foot trees lined the trail.

Even though my packing experiences are few it brought back a pleasant feeling to see the dust rising from the mule hooves, gleaming like mica in the morning sun. Trees, unidentifiable by me, of all sorts made the trail very interesting and beautiful. A large tree with yellow papery bark was common. Castillo called it “Heilo”. I think it is a close relative of the elephant tree. Many trees were hung with pendulous pods. Mimosaceous trees of various types were common. A tree with abundant large white flowers and leaves like those of the tulip tree were scattered among the others (tree morning glory). Several different crawling vines, including wild begonias (bougainvillea) with masses of bright magenta flowers wound among the trees. With the sun pouring down in twisting lanes? and tattered shade mottling the dusty trail I found it a most beautiful place.

We climbed rapidly, passing out of this forest into a sparser vegetation. At 4,500 ft. we came to our first deciduous oak tree. Though it is closely related to the Sonoran Mainland species it has much in common with the California Kellogg oak. The sun had set in, and by the time we stopped under a large oak, unpacked and ate lunch the day had grown torrid.

The mules weremuch refreshed by the rest and climbed a very steep hogback with little effort. Chuck (6'4½") was quite a load for his little mule. At 6,000 ft. the oaks were common

and we encountered our first pinon pine (*Pinus cembroides*), which is the same species as that on the Mexican mainland.

The trail followed a ridge from which we could see the ocean near Todos Santos and the precipitous western rise of the Sierra Laguna, up which we had climbed. The vegetation was now an oak-pine forest. Altitude had modified the heat and we became more comfortable. I gave Sr. Castillo my horse while I took a turn walking, as Chuck had done earlier.

At length we dropped down into a winding draw heavily vegetated with Pinons and Oaks. Our first Madrono was seen here, a great spreading giant with typical reddish peeling bark. Shortly a little grassy meadow was reached in which were several clear pools of water. The mules were watered and we rode on a short distance to La Laguna.

A sandy winding wash meanders out into a grassy valley of perhaps 500 acres extent. At one corner two stick and mud, thatched shacks are located and a rain gauge and thermometer shelter stand. These are operated by a man living at Rancho ____.

Rocky hills rim the valley on all sides and many large granite boulders are scattered around the edge of the meadow. 6 or 7 small streams flow over granite sand beds out into the meadow where they are clogged with water cress. There is no lake as such.

A band of horses ran off across the valley as we rode up. We camped under a huge spreading Madrono at the edge of the meadow. We were all weary (except the guides who had done all of the work and who had hiked most of the way) and so Chuck and Arlene went to sleep while I took a short hike. *Petrosaurus* is very common and very large—the size of a small Chuckwalla.

The tinkling of the bells on our hobbled mules was the only sound that was not strictly wild, and it is not a foreign sound in a place like this. I felt very peaceful, mostly because we were so far from the nearest big town or the nearest automobile. Here we are in Laguna, a fabled place visited by many famous naturalists and yearned for by many others. The impact of Loye Miller, Joseph Slevin, Dr. Eisen and E. Nelson and the rest is here and can be felt. I was impressed. It is something Chuck feels but Arlene cannot.

We wolfed down a dinner of meatballs, gravy and potatoes and coffee and took a walk on which we picked up *Xantusia*.

A note about the vegetation is in order. The pines here attain very large size—up to 70-80 feet high. The oaks, likewise, are sometimes huge. The pines seem to be taking the place of yellow pines could the latter species have invaded.

In the ecologic niche (equivalent niche) of poison oak is a mimosaceous plant with a red feather duster flower. Lower on the mountain many chaparral species have their equivalents—*Adenostema* for example is replaced by another mimosaceous plant with lavender flowers. *Rhus* has its equivalent.

July 4, 1949

La Laguna, Baja California del Sur, Mexico

We awoke about 6:00 AM after a very refreshing sleep. I took off on a hike after a pancake breakfast. I walked along the edge of the Laguna. Several *Petrosaurus* were seen and taken from the granite boulders.

The outlet of the laguna gathers all the water from the valley and forms a nice clear stream, tumbling down a narrow walled boulder choked canyon. Much vegetation fills the canyon. Grape vines, berry vines, and poison oak (a very much altered form recognisable only where lush). The Mexicans call the plant “Hiedra” which translated means Ivy. Water striders are present in tremendous numbers.

I stopped at a little water fall and a granite gravel pool full of clear bubbling water. I washed my clothes and myself. I needed it.

I returned to camp by crossing over a ridge, taking several more *Petrosaurus*. Cold pancakes and jam and coffee made a most acceptable lunch.

Chuck returned from a hike with Tino and Antonio with a rattlesnake, a spotted night snake, a *Xantusia*, and a pair of skinks, and several *Urosaurus*.

I left on another hike with the pinch bar. Much flaking and log rolling uncovered nothing. I was far out of sight of La Laguna. The direction I was hiking should have taken me to the outlet stream I figured, but it had turned so I was hiking away from the little valley. Finally I became a little worried and checked the sun. After a considerable walk up and down steep-walled canyons I saw a little section of La Laguna through the trees. It was a welcome sight as I was tired and in no mood for an extended hike around these precipitous mountains.

Back at camp Arlene cooked a good meal of chile con carne, coffee, and apricots.

I decided to whip up some biscuits and accordingly built a little fire, walled on three sides and set our big kettle on it. A small upside-down frying pan, inside greased, served as a pan. Everyone had suggestions, comments etcetera including Tino who said I was “Uno Nuevo Cocinero”. The biscuits were O.K. so I was spared any additional ribbing.

I noticed Anotnio building a fire for his cofffee con panoche (they boil the little moulds of panoche with coffee). He used little sticks and placed each one carefully so there would be plenty of draft. The training the Boy Scouts give tells you to build fires this way and I was pleased to see it done by a woodsman who had never seen a boy scout.

The rest of the night was spent with the specimens. Note: During the day Chuck, Tino, and Antonio were out hunting animals. Chuck rolled a pine log. He saw a skink. He grabbed for it and just before he put his hand down he saw a coiled rattlesnake under his hand. He kept on going and pinned the snake’s head with his hand. Of course Tino and Antonio were amazed (so was Chuck). I think they believe it is the way he normally catches rattlesnakes.

Today was Independence Day but we didn’t notice it.

July 5, 1949

La Laguna, Baja California del Sur, Mexico

While I was buttoning up my shirt during dressing, Tino and Antonio walked into camp carrying a deer.

The dog was fed (and he needed it). Antonio butchered the deer. He was very deft about it, first slicing off the backstrap and then the front saddle and legs. Then the ribs were removed. The hind legs were split at the pelvis and hung by a tendon. This maneuver was completed in about 15 minutes by using a long machete. Both Antonio and Tino carry sharp machetes which they use for all sorts of purposes—for clearing trails, gathering wood, butchering deer, and eating.

Chuck, Arlene, and I took a hike down the outlet stream. Though we searched long and hard flaking boulders and rolling logs we turned up nothing. I walked back to camp alone, shooting a pair of Juncos for Loye Miller on the way. These little birds have a tomato red eye and a pale grey head. Their underparts are buffy and they have a normal Junco tail with its 2 white feathers. It is classified as *Junco bairdi* at present, I believe.

I shot a Mexican white winged dove, and roasted him in the coals of a little fire, first oiling and salting his skin and then wrapping him in moist paper and then mud. He was steamed rather than baked. I left him in for about 50 minutes. A little more time would have improved the cooking job. Of course I was laughed at from all sides for my attempt—but that is to be expected.

Another long hike with much flaking and log rolling produced only 2 animals, an alligator lizard, and *Xantusia gibberti*. I returned to camp very much tired out. Chuck's luck had been no better, though earlier he had located several specimens. Each specimen obtained here in this season requires a large amount of work. We are not collecting *Petrosaurus* as we have a fine series already—32 individuals.

Tino presented us with one backstrap from the deer and we cooked it kabob style with slices of onion between the meat. It was delicious. Chuck and I were both starved after our day's work and ate as much as was given us.

These Mexicans are the most generous people I have ever had the pleasure of meeting. We ate a backstrap (the filets) while they roasted a rack of ribs. Probably they will take the other filet home. Pears and coffee completed the meal.

The weather here has been as beautiful as one could ask for. It is cool all day, though warm in the sun. In the afternoon there are cumulus clouds and once we had a few drops of rain though even then, most of the sky was blue. The nights are cool but not cold. All in all it is a welcome change from the heat of the desert. The drawbacks are insects: noseems in huge quantities under oak trees though there are few in camp, and poison ivy. All of us are breaking out a little but not badly as yet. I hope all will go well when we return to the heat below, tomorrow.

Tino says there is some snow here in December though not much because of the low altitude (6,800 ft.).

Specimens are piling up and so the rest of the evening will be spent with them.

July 6, 1949

La Burrerra, Baja California del Sur, Mexico

It is a shame to write notes at a time like this—I am in my sleeping bag on the floor of a sandy wash—all fagged out.

First thing this morning I took a walk around the west end of Laguna, rolling logs and rocks. My luck turned a little better and I returned to camp with 5 alligator lizards and 1 spotted night snake. We pickled specimens and packed. Chuck and I nearly had a tiff. He was cross from having worked till 1:00 AM the night before and I was tired from my hike. Sometimes I think it will be a small miracle if we ever get the paper on Lower California in print.

Chuck is strictly unidirectional. He is not interested in camping as such. He does not care what he eats or if he sleeps. He is apt to look askance at anyone else who is interested in other things. These things combined with a complete preoccupation make him hard to get along with as he is also moody and apt to turn to anger when tired. But when he is happy there is no better companion or field man.

We watched while Antonio and Tino put on the aparejos (stuffed pads for the mules) and then lashed on our gear. We could do nothing to help as every move during this operation is routine with them. I tried to help once but was obviously in the way.

I was sorry to leave Laguna. It is only a pretty meadow like many others in our Sierra Nevada but unlike them it is on the tip of Lower California, surrounded by a desert. It was such a change and relief to camp in its cool confines after almost 3 weeks in the desert. Our guides were congenial. They spent most of their day hunting specimens for us and returned to camp quite tired out (which means a tremendous lot of work for a Mexican guide).

We rode off down the trail, the little mule bells clinking as we passed through a forest of Madrono and pine. The understory in this forest is not dense. Under oaks, among rocks, and lining streams there are often dense thickets of shrubby plants, chiefly mimosaceous forms. In the stream canyons there is much poison ivy. It has leaves that are much more pointed than

poison oak and not so glossy. Also it seems to require much more moisture than poison oak, being replaced in the drier situations with a mimosa that has the same life form as poison oak, including red leaves.

The pack train plodded along under the forest canopy, passing up and out of the bowl-like valley of La Laguna. Once out of the valley we swung to a new trail and commenced to go down the scarp. This trail was much steeper and dustier than the other one. Much of the time I had to lead my little mule (Christmas Rosamond II). I asked Tino the mule's name. He said it had none. Antonio shouted back from his horse "El Diablo"—so that was its name from then on—the gentlest mule in the train—El Diablo indeed. He closed his eyes in contentment as I scratched his ears. Arlene's mule—also a gentle beast—had previously been named "El Malcreado". We all had a big laugh about these names.

Quickly the trail lost altitude as we wound down a 35 degree hogback. The pines were left and then the Encino Negros (a broad-leafed black oak not seen in the valley proper). For a time we passed through an area of little vegetation. The air became hotter and more humid. Before long we entered the strange foothill forest with its Mantos (a thin, graceful legume), Elephant Trees, begonias, and twisting lianas. Vines were everywhere as was a little bright green plant with vicious stinging hairs. I had learned of its venomous properties earlier—the hard way.

We saw brilliant red cardinals flying in this weird jungle. Chuck picked up a *Trimorphodon* (Lyre snake) that had recently been killed by a cow or mule. It was a fine rare specimen. Imagine a DOR on this little used road (trail)!

Chuck fired a shot at a *Cnemidophorus maximus* (whip-tailed lizard) and two of the mules bolted from the trail, deranging their packs somewhat. We stopped for a short while repairs were made.

Mule riding is just like horse riding as far as I can see. I have been told that proper riding is accomplished by using your legs to take up the shock as the animal jounces along. Also that your legs must be close to the animal's sides. With this information in mind I tested these notions and found that my legs became much more tired than my bottom had the other way.

Shortly we dropped down a steep slope and emerged at the upper ranch—run by Antonio's father, Sr. Salvatierra, a deep-voiced, rather rough fellow.

Tino left him some deer meat and we continued to the lower ranch where we took the bits from our mules and unpacked. La Burrera seemed (and was) hot and dirty after La Laguna. Somewhat against our feelings we camped in the arroyo and boiled water as our supply was nil. It took us 8 hours to La Laguna from La Burrera including 1 hour for lunch and 4 hours to return, including 20 minutes for lunch.

July 7, 1949

19.2 miles S. of Todos Santos, Baja California del Sur, Mexico

The night was spent warding off mosquitos and thinking about my various itches (not serious). Peace settled only after I walked to the car and got my mosquito bar.

We got up about 7:00 AM, all much the worse for wear and I began packing while Chuck hunted lizards.

Note: Just as we awoke Arlene came running down the wash shouting that some ninos had a vibora (rattlesnake) cornered. This was the only time I have ever seen Chuck not leap into action at the word "snake". He lay there debating whether to get up or not. He must have been really tired. Finally we arrived at the ranch house to find the ninos with a nice specimen of *Crotalus ruber lucasensis* noosed and alive.

While I was packing the children and Antonio brought in many good specimens including a *Salvadora* (patch-nosed snake). Chuck, Antonio, Tino, and I caught a 6 foot racer in a stone wall. He is a yellow animal with a black head. The snake is obviously one of the flegelb— group and appears to be a washed out pic--.

11:30 AM. We left La Burrera with many friendly good byes, adios's, and return some times.

Both Chuck and I had grown to like Tino and Antonio a great deal—for what they are—simple, generous, sometimes a little blunt, always gentlemanly people. They live so close to the plants and trees and animals, and soil that everything they do is tempered by it. Their generosity is a function of this—it might often be hard for any man to survive here by himself. These people make you stop and think about we Americans. Most of us are so self centered and smug—and for what reason? We don't have many of the things these poor Mexicans possess.

We work so fast that often we don't have time to stop and laugh. Tino caught a grasshopper and his whole large family was having a wonderful time watching him catch it. How many times have you seen a 45 year old American do something like this?

The tension here is survival. There is no uncertainty. Americans live in a world of uncertainty, tempered by events in Russia, Indochina, and all other places on the globe. I have not seen a newspaper in a month and have not missed them in the least. If one of these backwoods Mexicans has heard of San Diego or San Francisco he is unusual.

Which way is better? Probably neither one is better as each person is individual and would see things through the same set of emotions in either society.

We drove to Todos Santos and talked to Manuel Santana. He is a wonderful person. He offered to do anything for us if we come to Todos Santos again. We are going to send him a present from San Lucas.

We drove on south of Todos Santos through the little Mexican village of Pescadero. It is a real Mexica village of adobes, thatched roofs, and dogs, ninos, and carretas in the dirt street. The road becomes a two rut dirt road again and has several unmarked junctions south of Pescadero. We went a total of 17 miles on wrong roads. The San Lucas road is very little used and continues along the sea coast, sometimes just back of the sand.

The Sierra Lagunas rise abruptly to the east from a rolling, hill studded plain covered by a forest of thorny bushes and elephant trees so thick that a man on foot would have trouble passing through and it would be impossible for a man on horseback.

We camped alongside a little salt sump bordered by a few tall palms. I baked a bucket of biscuits for lunch and worked on specimens.

July 8, 1949

Cape San Lucas, Baja California del Sur, Mexico

We arose early, awakened by the passing of some Caballeros and the cows they were driving. They were the first people we had seen on the road south of Todos Santos. In fact we met no one on the road all the way to San Lucas.

Chuck and I began work on our specimens. Arlene did not feel too well so she slept. We worked steadily until 2:15 PM, preserving, cataloguing, tagging, and taking color notes. Each specimen shot requires a considerable amount of time before it is stowed away and forgotten for the time being. I put up the tarp for shade as we were near none. We ran out of water for preserving so Chuck and I walked down the road about 300 yards to a ranch I had spotted during an early morning walk. We found it abandoned. However it had a large (10 ft. in diam.) brick cistern, designed to trap rain water from the arroyo. 40 feet below we could see water. I found a

bucket and a palm fibre rope. After one lowering this broke and we constructed a majestic affair of rawhide strips, bits of rope, twine, etc. and then got our water.

2:30 PM. We broke camp and drove toward Migrino, a small village 27.5 miles north of San Lucas. The road was very poor being eroded and gulleyed in many places. Often we had to drive in 4 wheel low gear because of grades or ruts. Some stretches we made only 8 mph average.

The vegetation continued as a scrubby dense forest of Elephant trees and Cordon Grandes.

Often we passed beautiful white beaches that stretched along the seashore—completely untouched. Finally, the road cut inland leaving the seashore behind. It seemed unfortunate to leave the cool seashore but the new direction was not a disappointment as we passed up (on a very steep, poor road) and over the southern foothills of the Sierra Victorias. The scrub forest grew taller as we gained altitude. At 2,000 ft. the graceful Manto became common. Various vines and flowers made their appearance. Rocky hills of granite boulders stud the landscape here.

Shortly the road reached the summit and dropped down in an arroyo past the little village of Sandecito??. The road follows the arroyo here. It is good but sandy. Palo Blanco trees are numerous here and here they have their leaves, whereas at Santa Rosalia, the extreme heat of the gulf had left them bare.

On a long straight stretch of descending road we saw a cape of land jutting out into the sea. According to the map here was Cabo Falso—the false cape. We took some pictures and continued on our way. A villager informed us that it was Cape San Lucas. *We had traversed the length of Baja California.* I guess we should feel elated but somehow I didn't. The knowledge that we had reached the end hasn't sunk in yet.

A crescentic bay, lined by a white sand beach swings to the east of the rocky point of Cape San Lucas. The point itself is composed of 4 more or less disjunct rock peaks rising vertically from the water.

Alongside this rocky ridge back of the sand lies the town of San Lucas. It rises in tiers on the dry hillside. Oleanders and natal plums are everywhere. The houses are neat adobes and brick buildings. As usual, the best building, a large brick structure, is abandoned and roofless.

Along the sand, at the bases of the rocks is a cannery of some proportions, said by John Steinbeck to generate electricity for the San Lucas light, but since it operates only during the day the light is never lit at night.

We drove out east of town and camped back of the beach. I built a little stone fireplace and cooked coffee while Arlene prepared a dinner fit for a king of chicken and gravy, mashed potatoes, green beans, and cranberry sauce. We all ate until we were stuffed. All this was accomplished because the chicken, cranberry, and beans were canned, and the mashed potatoes were powdered.

After dinner we took a walk down to the beach. I wore my bathing suit. The air was just pleasantly warm. A full moon shone over the bay, glittering on the wavelets producing little flashes of light all along its path. The cape was pure black, outlined at the tip by moonlighted water and a backdrop of moonlit sky. A fishing boat rode at anchor, lighted brilliantly, apparently at work with cargo.

I took a timed exposure and then dove in the water. Often tropical water is so warm as to be enervating, but this was not, even though we are below both the Tropic of Cancer and the 23rd latitude.

All this was tremendously refreshing. We walked back to camp, each involved in his own thoughts.

The rest of the trip is toward home.

July 9, 1949

San Jose del Cabo, Baja California del Sur, Mexico

I woke up about 8 times last night because of mosquitoes, once I took a walk to the seashore. At sunrise the light brought hordes of noseems. I walked down to the beach again and lay down on the sand and slept until 8:00 AM when Chuck woke me. We packed and drove up to San Lucas. We went through the tuna cannery (planta). No canning was in progress. Out on their landing wharf we saw a group of fishermen. Upon looking into the water we saw a tremendous school of fish so dense the bottom was occluded in places. There were Sergeant Majors, Morena (trumpet fish—*Fistularia*), a sea eel, Botete (trunk fish), and red fish of some kind, and thousands of another grey species about ½ lb. in weight.

Back of the plant we stopped to do some collecting on the rocks. *Dispsosaurus* were very numerous. I saw one eating Bouganvillea blossoms.

On the rocks I took *Petrosaurus* and *Sceloporus orcutti*.

We continued on driving toward San Jose del Cabo. The road was fairly good though full of dips as it cuts across all the arroyos as they enter the sea. Weather was hot, clear, and sultry. Along the way we stopped alongside a gentleman and his son in a jeep. They had driven down to go fishing. He told about catching a 182 lb. Marlin off La Paz. They were from Long Beach, California. They seemed to be having trouble with their Spanish.

The road cuts along sea cliffs and through a small varicolored badland and through forests of Elephant trees, Mantos, Ocotillos, and various vines.

We ate lunch under a Palo Verde and I took a dip in the green ocean where it crashes on a small white beach at an arroyo mouth.

A short drive brought us up over a range of hills to a promontory where we could see a large river valley set among hills, leading up to the rugged sharp granite peaks of the Sierra Victoria to the north. In this Palm-filled valley lies San Jose del Cabo. From the start we did not like the place even though it is situated in such a beautiful location. The people seemed crude and the ninos were full of smart cracks.

The town is fairly large. It is not neat and shade is sparse even though in the fields, a few hundred yards away are beautiful mangoes, bananas, palms, sugar cane, corn, and along the roads tremendous cottonwoods.

The windows of the town are grated, either with iron or wood. Calsonines of various colors tint the doorways of all the houses. The town square is quite uninviting as squares go as its shade is limited to a few poor trees.

We located a cantina and billiards hall from which loud quartet music was pouring. Chuck and I bought six bottles of cold Carta Blanca Cerveza Exquisita and we retired to a large *Erythrina* tree and spent our most enjoyable moments in San Jose del Cabo.

While searching for a campsite near water we saw the large estero or lagoon where the river enters the ocean. Finally we were guided down back alleys by a nino to a spot, much bedecked by burro pies, adjacent to a stream of fresh water.

Here we activated by the local hoard of ninos by setting up various prices for different animals—1 peso for Brown Water Snakes (*Thamnophis*), 1 peso cinquenta centavos para Culebra del Agua Negro (*Natrix*), 15 centavos for Bejori (*Sceloporus*), 15 centavos for Camelones (horned lizards), 2 pesos for Coralillo (racer), 10 pesos for the first Ajolote (*Bipes*), 1 centavo for pesca (fish) and so on.

We lowered or raised our prices as animals came in or failed to. We got so many brown water snakes we had to say “no mas” for them. No *Bipes* were obtained (a two legged lizard).

The little kids flocked around, particularly when someone was getting paid. We had fresh kids (who caught few snakes), a few silent hard working ones who were our mainstays, and hoards of silent ones, including little girls and grown men who merely sat on their haunches and watched our every move.

We never got quite used to working on and ignoring these people (they needed no other amusement than watching us). If an empty tin can was dropped it was snatched up as they are valuable prizes here. There are no beer cans on the roads of Mexico. Arlene, in particular, did not like to have them around at dinner time. They had to be shooed. They would go off about 50 yards and close in again when we turned to other work. We told them to go home to dinner. “Adios” we said—and they repeated “Adios” but did not go home. All day they came up and said “Adios” until we would have gladly choked a few.

I washed clothes and boiled water. The water flows in three streams. A woman told Arlene the middle stream was “mejor” (better) and promptly showed us how good it was by washing her feet in it.

In the evening great grey and white thunderheads filled the sky. We could see lightning and heard occasional thunder. I ditched the leanto and Chuck and I set up the tent for Arlene. The smell of rain was around us. The air was sultry and passed by us in fitful gusts. Rain fell a few drops and then all fell dead calm. It became hot. I sweated as I lay on my cot under the mosquito bar. I could see the moon behind still palms through gaps in the clouds. All in all a very tropical picture.

July 10, 1949

North of Buena Vista, Baja California del Sur, Mexico

We arose early and worked on specimens till 3:00 PM amid fluctuating Sunday hoards of idle Mexicans down to see the crazy Americans who paid pesos for water snakes. The heat and humidity were terrific and our locale was far from scenic as we were adjacent to a main footpath and watering station.

We were all glad to leave and get on the road again. The road took us north toward black clouds and rain. Before long (driving on a very good dirt road) we came to Miraflores, a small town set on the bank of an Arroyo.

Miraflores is a quiet place of palms, mangoes, bananas, and vines, of adobes with thatched roofs or stick and mud dwellings. The thatch is trimmed on the edge like bangs and often allowed to hang down a foot or so from the roof giving the impression of hair that has grown too long.

Many people were gathered under trees by the community bake oven talking quietly and laughing.

One house, in particular, in Miraflores, was attractive. A veritable jungle of potted plants, bouganvillea, grapes, and small shrubs grew in front of the house—which was a whitewashed adobe with a thatched roof. Through the foliage and a diagonal lattice we could see wide hard packed floors and simple wooden furniture. A stone olla hung from a beam and several bird cages could be seen. Large beams, supported here and there by smooth poles with a forked end formed the roof. Everything was immaculate which is more amazing when you consider that the floors were dirt.

All the Mexicans appear after siesta (12-3 PM) in clean starched clothes—usually a white jacket and pants, a straw sombrero, and sandals (or none). Many of the little ninos (about 5 years old or under) appear “au naturel” and look much the cooler for it.

Out of Miraflores we passed through another forest and saw several iguanas (*Ctenosaurus*) in the trees and on Cordon Grandes.

Santiago was the next town. It is old. Old stone work lines its bluffs. The town is on an island in the center of a large arroyo and is hot and dusty and shadeless. The town square is exposed and little used. All around the town in the bottomland of the arroyo are fields of tall sugar cane and corn. Many cocoanut palms line foot paths. It is a beautiful green place. Back of the town rises the Sierra Victoria, which at our visit was covered with clouds and rain. It was nearly sunset and shafts of light pierced through making a most beautiful scene.

Shortly after we drove into the rain. The smell of wet ground and the paddling of the jeep through the puddles were highly pleasing. We followed the shoreline and then cut inland and camped along the road. It is still cloudy but I do not think it will rain again.

July 11, 1949

La Paz Plain (S. of La Paz), Baja California del Sur, Mexico

Up with the sun (and the noseums). One must adjust his schedule to these animals as they do not adjust.

We drove up a wide arroyo toward San Bartolo and the Sierra Victoria. The canyon narrowed and became steep walled. Clinging to the granite cliffs were many huge, white trunked fig trees. Their roots are thick and high ribbed like a banyan tree at the trunk and crawl like snakes over the surface of the cliffs for long distances.

Chuck and I had a field day here, collecting many animals. We took the beautiful blue, green, orange, and tan *Petrosaurus* in numbers from the cliffs. We collected *Cnemidophorus maximus*, a huge race of whip-tailed lizard that races up cliffs like a rocket. We took *Ctenosaurus*, the spiny tailed iguana, a big fellow with a large dew lap and spines along his neck.

The road cut sharply up out of the Arroyo under palms and mangoes and drops into the town of San Bartolo. A small dam holds water for irrigation. Groves of citrus fruits (citrons, limes, and lemons), mangoes, and sapotes line the arroyo bank on both sides. There are many palms and the huge fig tree is common, reaching well over 100 ft.

We ate sapotes and mangoes. Both were delicious fare.

While hunting for Elaphe in the trees I was accosted by a woman dressed in black. She gave forth with a constant flow of fast Spanish—all unintelligible to me. Finally I realized she was trying to sell me a pig. She was not a little disappointed that her sales talk had fallen through. I suppose I had said “si” enough times to make her think she was winning me over.

The road wound out of town through a forest of sclerophyll trees. These trees, with their thin leaves give rather scanty shade (except mesquite or Palo Verde) and the hillsides give the impression of being thinly vegetated. They are far from it as it is difficult to find a way through and every species has its own thorn or sting (except the dumpy Elephant trees).

The road is excellent as compared to other Baja California roads. We made 30 mph at times.

In the midst of a forest of Palo Blancos just before we arrive at Santonio, Chuck saw a mine shaft going back into the hill on the north side of the road. We walked back in it a long way. The air was a cool 22 degrees C., quite a change from the heat outside. Back about 150 feet we came upon a group of 14 bats (*Myotis* I suspect) clustered together on the ceiling. Farther back we came to a shaft leading up. We stopped and shortly we heard a noise that I took to be thunder, but it turned out to be hoards of bats flying in the shaft. Our flashlight beam turned them and they flew back and forth. Some flew past us but would not go out into the sunlight so we had milling bats on both sides of us.

Over the hill is the little town of Santonio. We bought rice and gasoline. The latter came from a *pump*! Most of our other gas had come from big barrels by the mouth siphon method of El Arco, or from 5 gallon tins. The town is quite shady and supports several brick buildings and

a church of some beauty and antiquity. A little further we dropped into a tree-filled valley from which juts a huge brick stack of 150 ft. height. Under the trees we located Triunfo.

5:00. It may have been the time of day but the place seems all but deserted. Many of the buildings on the main street are boarded up or locked. The square is barren and shadeless. I suspect that 500 people might live here.

We passed through a low rocky canyon and out onto the La Paz plain. Shortly the junction with the Todos Santos Road was reached and the new scenery of our trip was over. We are really homeward bound though we still have 12-14 days travel ahead. It will not be leisurely travel as we will probably try to make 100 miles per day. Driving 100 miles on these roads is a good day's work in itself.

We are camped under a big mesquite about 5 miles out of La Paz to the south. 2 wistful looking cows are nosing around camp. We had rice and meat balls and canned peaches for dinner. I was about starved so we broke out some ginger snaps and ate them too. Specimens are next and then the sack.

July 12, 1949

El Medano, Baja California del Sur, Mexico

The ants got us up and we proceeded towards La Paz. On the way Chuck spotted a Chuckwalla and we spent a half hour getting the animal out of a crevasse. A hike produced 3 other animals. We drove into town and had the car greased, bought groceries at Rufo's, and stopped by the Aloha Bar for some "Cerveza Exquisita". Chuck and I had a few while Arlene went shopping for a purse. The bartender is a jolly young fellow named Jesus Ortega Ojeda. He is the son of the Jefe Secretario of La Paz. He told us there are 16,000 people in La Paz.

After about 4 rounds ("Dos Mas") Arlene returned with two bags and had a beer with us (they are small and cost 1 peso or about 12 cents). We took out 3 bottles and ate lunch under palms along the waterfront.

We drove rapidly out of town (the pressure of time is really on us now) and over the foothills of the Sierra Giganta and Magdalena Plain to El Medano. 8:30 PM. Near El Medano we picked up a *Chilomenisaurus* (Bearded burrowing snake). Camp was made about 9:00 PM on a playa. We had few specimens so we hit the sack at 11:30.

July 13, 1949

San Ysidro, Baja California del Sur, Mexico

When I woke up, everyone else was wandering around, dressed, eating "Tostados de Mais"—(Kellogg's Corn Flakes). No bags were about, which was a welcome change.

We drove, picking up several horned lizards and scaly lizards on the way. The Magdalena Plain is quite monotonous driving and these animals livened our way.

Once I saw a black racer disappear into a bush. We leaped out and cornered him (or so we thought). Instead of staying on the ground he raced aloft 4 or 5 ft. Since the bush was a Mesquite we could not grab him though Chuck tried and got punctured in the attempt. The snake slid down and out of the bush and under the car before we knew what had happened. Finally we did catch him but he gave us a real chase.

At Santo Domingo we pulled in alongside Don Santos Castro's little casa. He came out and said he had "Ajolotes" for us at his garden. We drove down to his fine farm and he pulled some brush away from a hole in the moist earth. In the bottom was our coffee jar, buried in the cool damp soil. Excitedly we dumped out 2 of the strange pink *Bipes*, the lizard with two hands coming out of its neck and no hind limbs. In the jar were 7 specimens in all.

These animals have a small head with two sightless eyespots, two mole-like hands with which they pull themselves along, and a large flaccid worm-like body and blunt tail. A large specimen may be 12 inches long. It is easy to see why the natives often fear this animal (though Sr. Santos Castro knew they were harmless). The creature must be entirely subterranean except when rains drive them to the surface. We paid Sr. Castro two pesos for each animal (catorce pesos) and left.

Just before sunset we stopped for dinner in a fine arroyo filled with Cordon Grandes. A little food made me feel better as I had been a bit low for the first time since the heat of Santa Rosalia had touched me when the car had been stuck in the sand. We drove on to La Purissima and found it 15 miles closer than the map shows. Camp was made at our old spot alongside the sluice. Water boiling operations were begun at once. I picked up a *Leptotyphlops* while going a la little boy's room.

Specimens occupied the night. We made about 160 miles today.

July 15, 1949 [no July 14]

Mulege, Baja California del Sur, Mexico

Arose and had a small cup of oatmeal and commenced driving up Purissima Canyon towards the gulf coast. We collected a good series of animals including *Sceloporus orcutti* and *Dipsosaurus*. The hot sultry gulf climate became apparent as we moved eastward. Very little air stirs and you begin to feel like a wet, hot dishrag. As we approached the Bahia de la Concepcion it became hotter and sultrier. It was easy to envy the Tropic birds that were circling slowly in the cool upper air.

We traversed the forest of Cordon Grandes that line the southern edge of the Bahia. We crossed the road where it clings to the cliffs above the water. And finally we came again to the white sand beaches and islands where we had washed our dishes about a month before. I took a short walk and picked up some of the beautiful shells that are scattered over the sand. A bright rose colored *Murex* is fairly common here. The sand on which we hunted was in a beautiful location. A small island is connected to the shore by a thin strand of sand about 200 yards long. The center of this strand is covered at high tide, by 'knee deep' water. A single Mangrove grows on the sand.

We drove on, catching 6 specimens of the Collared Lizard—an animal never before taken in this area.

The sun's heat was abating and we were nearing Mulege when I tried to shift into low gear while climbing a small hill. The car would not shift and stopped dead still on the hill. We were blocking the road completely and could do nothing about it. The trouble is still unknown though it is probably a broken axle or drive shaft.

Chuck and Arlene and I sat down on the rocky slope while we tried to puzzle out what to do next. I wanted to look at the gear box and 4 wheel drive mechanism to see if something was jammed there and to see if the gear forks might have been displaced. Chuck thought it might be in the shifting mechanism near the base of the steering post. A little fiddling produced no results. At this time we heard the whine of a truck climbing the hill below. Shortly they came up behind us. In it were three young Mexicans, an older fellow, and a load of Queso (cheese). The driver came up and fooled with the gear box. Finally we decided to have Chuck ride into town with the truck. To get it around us we cleared away a group of 400-500 lb. boulders from a small wash. They tried to drive the truck through but could not. More playing around with the gear box in neutral and it rolled down hill. After a little work we revised positions and the truck began towing us to Mulege, which they said was "muy cerquita" (very close by).

We found that we had been stuck on the south slope of “Cuesta Tiburon”. The north slope is a series of hairpin turns descending a volcanic slope. One of these turns is very sharp—in fact we had to back up to get around it on our way south.

The big truck (a 49 Ford) backed up and made it but I had no power and could not back. After a few very anxious moments I cleared the turn by about 3 inches—no more. Another turn was nearly as close.

One young fellow rode with me. We had quite a conversation—from the price of shirts (40 pesos) to how to drink Tequila. He deplored conditions in Mexico saying that nearly everyone was poor and that there was little water. He agreed that the language was better than English and the people in Baja California more honest (we have had nothing stolen though many times our equipment has been all spread out with dozens of Mexican men, women, and children milling around watching us). I learned of the red snake that is as bad as a viper but does not bite—instead it lashes you with its poisonous tail. In Mexico nearby everyone falls prey to these stories and believes them implicitly—even many of the educated people. Tino Castillo—our guide at Laguna—would help bag a rattlesnake but would not touch the small harmless Gecko, *Phyllodactylus*. To him and to all other Mexicans I talked to the “Salaneanquesa” is deadly poisonous. It may be that this superstition has arisen because scorpions and geckos occupy the same habitat. A careless hand placed under the loose bark of a Manto tree might be objected to by a scorpion and when the bark was removed little malevolent *Phyllodactylus* would be sitting there leering out of his slit pupils.

We were pulled toward Mulege just at sunset and it was quite dark when we arrived. The trip had consumed 1 hour. I bought soda pop for all hands (they did not want beer) and we were taken to a triangular dirt square formed in the angle of two diagonal streets. On the side was a thatched-roofed garage and on the other was the Power Plant. Behind us, abutting the triangle of the square was a thatch and stick dwelling containing numerous Mexicans. The driver introduced us to Mr. Ruiz, the mechanic of Mulege who was “igual a Santa Rosalia” (equal to those of Santa Rosalia).

Mr. Ruiz was a small portly gentleman, with a stubble beard, round dime store glasses, and some very dirty clothes (we were far dirtier however). He was a fine fellow. He talked slowly and made sure we understood him before he went on. He said that he would see us “la primera hora en la madrugada” (the first hour in the morning).

There is a telegraph office here which we may have to use to send for parts as there are none here for jeeps I am sure.

We had a cold dinner of spam, crackers, peanut butter, and canned fruit. As we are all very tired and a good deal dismayed we are going to bed now. The place is very public but it is the best we can do with the car broken down. The air is still, probably because we are in the center of town, very hot and muggy. We three are as dirty as we have ever been and are all saturated with perspiration. I feel like a hot, damp, and dirty dishrag—the kind you would rather throw away than wash.

July 16, 1949

San Ignacio, Baja California del Sur, Mexico

It is hard to realize how vocal and noisy a Spanish town is until you have slept in the Plaza of one. Myriads of dogs yapped all night in dozens of different voices. Several burros and mules wandered aimlessly about the streets, giving vent to the most pained sorts of retching “heehaws”. Young men walked along the broken sidewalks until late at night, whistling loudly, so as to be heard above the dogs. In the house abutting the square women laughed and chattered in high pitched penetrating Spanish voices.

We didn't take off our clothes to sleep as it was too hot to get in the bags and there were too many people around to undress. In this uncomfortable, sweaty, noisy state I went to sleep only to be awakened shortly by rain. In a sleepy exhausted daze I stowed cartons and books away and then lay down on my sleeping bag waiting for it to stop—which it did shortly. Later we had another—more violent shower which I ignored completely.

I awoke to find Sr. Ruiz waiting for us to awake. He tinkered with the gears for a moment and asked us some questions. We had difficulty in explaining to him what had happened as we had no vocabulary of automotive terms at our command. He left us and returned shortly with a dapper indian type fellow who spoke English. This gentleman was named Jose Louis Kelly Dorantes. He was part Cherokee Indian, having been born in Chickasaw, Oklahoma. It turned out that he was a convict serving 9 years for murdering a man in Mazatlan. He was apparently quite popular in town and wandered around at will, doing as he pleased and stopping by the Calabozo for meals. With his aid we explained all to Sr. Ruiz and forthwith he fixed the trouble in less than ten minutes. Gears had jammed in the gear box due to bad shifting. Sr. Dorantes said Sr. Ruiz was a mechanic of all things from watches to the generators in the light plant where he was the Engineer, hired by the Mexican Government. He would accept no money until we gave him 10 pesos (he wouldn't take 20 through Sr. Dorantes).

Arlene was carrying on a spirited conversation with our benign murderer while we thanked Sr. Ruiz. Sr. Dorantes asked us to send him reading material and post cards. This we shall do.

We drove (I couldn't believe it) out of town and on to Santa Rosalia. Here we got gas and some food and a few bottles of beer (Pacifica—which cannot hold a candle to Carta Blanca). We drove on, up the Cuesta de La Infierno, past the new (8 years old) Manganese mine where dump trucks hauled out coal black ore from a horizontal bed.

The trip to San Ignacio was quite uneventful except the weather became cool once we left the gulf coast. Camp was made above town at a small clearing in the rocks. Small dry *Larrea* stems were the only fuel as the local lenadores (woodgatherers) had cleaned the area to the last stick.

July 17, 1949

Del Sur—Del Norte Line, Baja California, Mexico

The morning was spent writing notes and hunting turtles in the large posa (pond). The reed covered banks made hunting very difficult and though we saw many (*Pseudemmys ornata*) sitting with their heads raised above the sargassum we could catch none. This was very tantalizing, as the animal has never been taken here and it is about 300 miles from the nearest recorded locality.

About noon a little nino volunteered to take us to the "Poza grande" where he said there were many turtles. This pond is a long shallow one with clean rocky banks lying in an arroyo southeast of the main canyon. We saw only two turtles because the heat of the day had arrived and the turtles had sounded. If we had known about the Posa Grande . . .

July 18, 1949

Del Norte-Del Sur line, Baja California, Mexico

We packed up and said adios to all our nino friends. We liked San Ignacio. It is pretty and breezy and has cool nights, but most of all the people were nice and the children were well behaved.

The road leaving San Ignacio is rough and rocky for about 20 miles and then it drops onto the Vizcaino desert and becomes sandy. In most places it is good here but occasional dunes would seem all but impassable to 2 wheel drive cars.

We had talked to Mr. Meadows and Son (from Long Beach) at San Ignacio and we ran in his tracks all afternoon.

We drove on into the night.

Making camp on the line that separates Del sur and Del Norte.

4 mi. N. Punta Prieta, Baja California del Norte, Mexico

This morning we drove into El Arco and asked our government official directions to Calmulle [Calamajue?]. He told us and asked us if we had gotten all our snakes. We said we had caught enough. He then sneered at us as if we were crazy and retreated to his office.

We drove up a rocky dirt road 3 miles to Pozo Aleman. This small village is apparently centered around a large windmill. Some mining is done in the vicinity. 5 miles more brought us to the hot, dusty, and dilapidated town of Camilli. A government building occupies the center of a group of adobes. In front of it is a flag pole with a copper ore base. Ore dumps from the refinery are piled on the hillsides. Very little machinery is in evidence and most of the work must be accomplished by hand. We drove northward and out a narrow canyon with lava walls. Here we potted some slips of a sage for Dr. Epling and took Collared Lizards. Also the southernmost Cirio was noted. We ate a pancake lunch and pushed on—driving till late at night. At 11:00 PM I saw a stick that shone, lying under a bush alongside this road. We backed up and it proved to be a California Boa (*Lichanura roseofusca gracia*). This is the southernmost record for this animal by about 100+ miles. They are very docile creatures and never move quickly except when striking prey.

We camped under a big Cordon Grande on a shelf above the arroyo in which Punta Prieta sits.

July 19, 1949

13.1 mi N. Catavina, Baja California del Norte, Mexico

Today we drove to the locality (6.2 miles S. Laguna Seca Chapala) where we had previously tried to smoke out a Chuckwalla. We caught two adult males and 1 female. The males are a sooty black with a yellow tail and Chuck thinks they represent a new race. Certainly the animal is unique among the Chuckwallas I have seen.

After collecting at this locality we drove the terrible road to Catavina. It is one of the worst stretches on the whole road and there is thirty miles of it—sharp rocks, ruts, and steep grades.

Chuck was driving along about 5 miles per hour when we heard a tremendous thud under the car. I looked under and found that we had hit a rock (which none of us saw or could find) and had bent a flange on a crossmember of the frame. No damage was done but it shows what sort of road we were traversing.

Past Catavina the road is a good granite dust road and we had little trouble making it to a camp in a sandy arroyo where we had collected on our first leg. I was very tired and sleepy and so went to sleep for half an hour under a mesquite with no trouble. My air mattress has long since departed in this land of Cacti so now I can sleep on nearly any substrate with no pains the morning after—gravel, sticks, or sand all feel like a Simmon's Inner Spring after a hard day's work. I tagged my specimens and went to bed.

July 20, 1949

Rosario, Baja California del Norte, Mexico

Immediately after getting up and eating some of Arlene's rice pancakes Chuck and I hike to a distant rocky hill on a collecting walk. We didn't get many animals. Upon returning about about 11:00 AM we packed and drove on, out of the Cirio-Cardon forest to El Marmol and then to a Windmill where we all took showers and washed off some of the fine dust of Laguna Seca Chapala that is ½ inch thick over everything in the back of the truck and which had formed a considerable coating over us also.

We drove on up and over a section of road as bad as that south of Catavina and made camp 5 miles East of Rosario. Arlene is baking twist bread over a fire I built to keep us warm. Fog is hanging over the hills and the night is very cool—just like it was when we were here before.

July 21, 1949

San Telmo Rd. near Main Hwy, Baja California T. N.

We slept late and finally got up because of the sun and the flies. At Rosario we bought a little food and gasoline. There we met some fellows who had driven down in a new Ford sedan. They were cursing all the Mexicans for the high center highways.

A little way north of Rosario we noted snake tracks crossing the roads. I followed the trail and shortly came upon a red rattlesnake sitting coiled in a burrow. A little later we saw another track and this time Arlene spotted the snake coiled in the mouth of a burrow. It proved to be *Crotalus enyo*, the Lower Calif. Rattlesnake. Chuck and I were very excited as this is the first time this snake has been taken north of Punta Prieta, 200 miles to the south. A little farther on we saw another track. After some difficulty Chuck found the snake coiled under an *Opuntia*. It was a female Red Rattlesnake. Chuck took pictures and we drove on—following several blind tracks.

At San Quentin plain we stopped and were introduced by our friend Mr. Meadows, to Frank Frymier, a rancher on the plain. His ranch is owned jointly by three men—Mr. Ingles, Mr. Castillo, and Mr. Frymier.

They have a nice warehouse, a group of dwellings for the workers, and a C shaped ranch house of stuccoed adobe—one wing for each owner.

Over a couple of cans of Tecate Cerveza we learned of all sorts of roads—one from Ensenada to San Felipe that takes about 11 hours to traverse—of roads into the pine forest of the Sierra Juarez. He said Laguna Hansen was once full of big bass and supported a large duck population.

While he fixed one of his pumps we learned about other roads.

His wells hit water at 40 feet but have been put down 120 ft. No bottom is hit—only mud, which restricts flow a good deal. With more water this plain has unlimited possibilities. We drove on and made camp after dark in a wash along the San Telmo ??. Arlene cooked up a “last supper” of mashed potatoes, meat balls, peas, peaches, and coffee.

July 22, 1949

Los Angeles, California

We all slept rather late and were driven out of the sack by the sun. A cup of “Café Peninsular” and we were off.

We collected a few animals as we passed out of the coastal agave covered plain. Then we passed into the familiar rolling plain studded with granite hills and mountains near San Vicente. The aspect had changed in a month—all the wheat fields had ripened and some had been mowed.

Already Chuck and I were planning our next trip to Baja California (a short trip to San Felipe and south to Los Angeles Bay by fishing boat). The feeling of wanting to get home was present but not because any of us wanted to catch up with the news or enter the old swim at UCLA again. All those things had been forgotten nearly and I, for one, was not anxious to start in again with the old grind. Of course, we both have the prospect of a trip to New Mexico (4 days after we return). I look forward to this as it should prove to be relaxation of a sort as we will have a permanent camp among the Pinon pines on the Chupadora Mesa.

We arrived in Ensenada, hungry as wolves, whereupon we descended on the “Panaderia” (Bake shop). The numerous kinds of cookies and pastries are on trays arranged on racks that line the walls. With a tray and a pair of tongs you go around and pick out what you want. A huge sackfull came to 35 cents Ameican. We each picked out our own and with a quart of milk we stuffed ourselves so full of goodies we never want to go in a Panaderia again.

We then drove the beautiful coast road to Tijuana.

We were worried about our specimens and the plants for Dr. Epling—particularly about the live turtles and rattlesnakes. To have them taken away at the border would be a calamity as we had the types of a new race of Chuckwalla and a probable new race of rattlesnake.

We drove through the border with no trouble—being asked only to declare Arlene’s purchases that she had picked up in La Paz. It was with great relief that we drove off with our loot.

A steak dinner merely added to the uncomfortable feeling brought on by the Panaderia.

I arrived home at 1:00 AM temporarily somewhat the worse for wear.

Our trip is over but the work on “The Herpetology of Baja California” has hardly begun. Chuck and I figure 4 years work will see all our data worked up into a comprehensive report.

January/February 1949
March 1949
March 1949
March 1949
April 1949
April 1949
April 1949
May 1949
May 1949
July/August 1949
October 1949

Baja California
Panamint Mts.
Palm Springs area
San Francisco/Reno/Death Valley
Colorado Desert
Arcadia
Desert trip
Desert trip
Arizona/Mexico
New Mexico
Chuckwalla Springs

Jan 29, 1949

7:15 AM. Left Lowe's house with University jeep and my jeep truck. Weather at Los Angeles was above freezing (slightly) at this time.

12:00 Noon. Stopped at Reptile House at San Diego and had a talk with C. B. Perkins.

11:15 PM. Crossed into Mexico. The Agent was too lazy either to write us passports or charge us the usual \$2. Along the coast to the south of Tijuana the flora consisted of dense *Agave* (a species new to me), some of which were in bloom, a *Cereus* cactus, and coastal sage. *Rhus* also noted.

In Santa Monica Mts. temperatures were cold enough to freeze *Rhus*. These plants along the Mexican coast are apparently unaffected. Snow was present on the north side of mountains forming the south rim of Bahia Todos Santos—about 5 miles south of Ensenada. It extended from the peaks down the mountainside 200 or 300 feet.

Along the coast exceptionally flat beaches were noted. At high tide this sand is apparently completely covered, the water at this time abutting against a layer of volcanic rock. This sand is apparently prevented from assuming any of the typical dune shapes by this water coverage.

Camped in oak woodland 23 miles south of Ensenada. The air is cool, soil damp, skies clear. A stream with a few calling *Hyla* was below our camp

Water temperature at 7:00 PM—9.9 degrees C. Air 1 inch over water—4.1 degrees C. 5 cm above ground—2.9 degrees C.

The *Hyla* are apparently still out by virtue of the warmth of the water. The ground is covered with newly sprouted grass. The camp is situated in a rather wide (1/4 mile) canyon, apparently the result of rather rapid erosion—I suspect the mountains on either side have not yet reached maturity. The Sierra Juarez could be seen from Ensenada and were covered with snow. 7.5 pesos=1 dollar.

January 30, 1949

Arose around 8:00 AM. It had frozen during the night and my sleeping bag was covered with frost. We drove down to Santo Tomas, a small village on the south side of a fault rift valley. The feet of the spurs on the south side of the valley showed evidence of two uplifts, one of 30 or 40 feet and the last one of 10 feet approx.

The fault ran in a WNW direction approximately. Santo Tomas was built directly on top of the fault line. The rift valley was cultivated and large fields of grapes were being raised.

The road leads over the fault ridge and down into a valley in which a considerable stream of water was running. At the lower end of this valley the water was standing in considerable pools. *Carex* was in abundance. The north slope of this valley was covered with *Agave*, some of which were in bloom and others nearly so. These buds look like swollen clubs. The flora on the south slope more closely resembled chapparal.

We then dropped down onto the coastal plain, a broad plain approximately 7-10 miles from the ocean to the foothills. It is extremely flat, apparently a wave cut terrace. Here and there it is dissected by arroyos, most containing streams at this time. The flora of the plain is a rather poor one consisting of agave, a cactus looking like a *Cereus*, and coastal sage? The soil is leached and red.

We drove down a gravel road (since 12 miles south of San Vincente) to Hamilton Ranch. Actually we did not quite reach the ranch but stopped at Colonia Guerrara about 1 mile south of the Rio Santo Domingo.

There we met Charles Lamb, author of *Enchanted Vagabonds*. He had a jeep equipped with a boat, a 110V generator, all sorts of cabinets, and a sound scribe, with which he recorded conversations with natives and travellers.

We decided to go to San Jose, a cattle camp at the foot of the Sierra San Pedro Martir. We turned around and proceeded back 20 miles to the San Telmo-San Jose Road. It was a reasonably good road, requiring low gear in some places. In spite of the fact that it runs in stream bottoms part of the way and that it had rained in the last three days, erosion was not sufficient to cause trouble. After leaving San Telmo, a town of about 40 people, adobes surrounded by 4 or 5 *Washingtonia* palms and 1 date palm, and considerable lush fields of beavertail cactus, we crossed a high narrow spur and dropped down into a segment of the Rio San Telmo river valley, a prosperous looking ranch raising sorghum and cotton. The soil was quite sandy. In its unplowed portions this valley was a nearly pure stand of *Lycium* sp. After leaving this river valley we entered a forest of various chapparal plants and desert plants including *Yucca mohavensis*, *Adenostema*, *Eriogonum fasciculatum*, *Eriodictyon*, lemonade berry, *Artemisia tridentata*. *Agave* had dropped out. In addition *Encelia farinosa* and possibly *E. californica*, *Ephedra californica*, *Simmondsia*, *Arcotstaphylos* sp. Ribbonwood was present with the *Lycium*.

This weird agglomeration gradually gives way to a more typical chapparal as we went into San Jose, a prosperous cattle ranch, situated in a cottonwood-willow riverbottom. There are several houses—2 are frame buildings, the rest adobe. There is an air strip just east of the house. One large Swainson's? hawk was seen near the ranch. The hills to the east of the ranch are covered with granite outcroppings and look like good territory for *Xantusia* and *Trimorphodon*.

We drove up an old mining road from the ranch. It was a lulu and required 4 wheel drive in several places. We camped in a little swale just at dusk. There was considerable snow-ice on north facing slopes under the chapparal.

By 7:00 PM the temperature was down to freezing. After a good meal of canned meat balls, I constructed 4 loaves of pan bread presumably to be eaten tomorrow on our hike to the oasis. They look a little heavy. The night is clear and now the road is covered

with frost. The Sierra San Pedro Martirs are completely snow covered. The escarpment can be seen and is apparently rather steep. Off to the frozen sack. (Altitude approximately 3,200 ft.)

January 31, 1949

Proceeded up the mine road to a point about 10 miles from San Jose. We passed considerable snow and were finally stoped by a snow bank. The ground was too slippery to pass over even after ruts had been dug with shovels. Just behind us, at this time, were the ruins of two old adobe houses and a stone chimney. Other stone foundations were evident. This was the Socorro mine of worked placer deposits. One [Ore?] cont-graphite or molybdenite was found.

We hiked about ½ mile farther down the road to a point where it descended into a steep north-south canyon. Here we noted *Pinus quadrifolia*. At this point we were at about 4,500 ft. and 1 or 2 ridges away from the main western escarpment of the Sierra San Pedro Martir.

The sky looked ominous and as the road was a bad one at best (4 wheel drive in several places) we decided to return to San Jose.

3 species of *Manzanita* were noted and 2 of *Rhus*—*laurina* and *guala*? [?] The *Encelia farinosa* of yesterday proved to be a similar form but not identical. *Yucca whipplei* was noted. Back at the ranch we met the owners:

Mr. & Mrs. Salvador Meling

Rancho San Jose

San Telmo, B.C., Mexico

She invited us in and we had a considerable talk. She informed us that we could reach the top of the scarp on horseback in one day. She said there were 7 meadows on top and an old mission built for the Indians (now absent), a belt of oaks is traversed before reaching the pine covered plateau on top. This table is highest (approximately 10,000 ft.) on its northeastern edge. Separate from the table are the high peaks (11,000 ft.)—Rio San Antonio (containing *Salmo nelsoni*), she said, drains about ¾ of the western scarp. The trout are found in the river below the falls. She said a Mr. Utt had planted these trout in all the streams of the Sierra S. P. Martir.

In addition he had introduced pheasants and red fox squirrels to the Sierra S.P.M. He had done it so that he might leave something when he died. He operated an orange juice plant at Tustin, Cal. and owns a house and grove near Oxnard, Calif.

Mrs. Meling tells of mounds of oyster? Shells—one 6 miles or so west of her ranch and another at the south end of a sandy valley (desert) to the east of Sierra. She also says that great quantities of Indian relics including obsidian arrowheads and pottery were found in the sandy areas to the west of the gulf (near San Felipe) behind the row sand dunes that skirt the coast. She mentioned great quantities of shell fish in the sand south of San Felipe.

She mentioned that the vaqueros burned the brush to drive the cattle out as there was no other way of getting them out. She said the whole area had been burned over at one time or another. Apparently none of the ranch hands had seen salamanders though they were familiar with waterdogs. Coral kings (on top of the scarp), garter snakes, and turtles (probably *Clemmys*) were reported. A *Clemmys* was caught on a hook and line in Rio San Antonio. Black rattlesnakes and one black and white one was mentioned.

We purchased 5 gallons of gas (2\$) and drove off.

San Jose is on Rio San Telmo rather than Rio Santo Domingo as shown on the map. 2 miles west of San Telmo we stopped to investigate a chorus of *Hyla*. Some were captured. They were all of the brown phase. We heard what sounded like *Scaphiopus hammondi*. The water was slowly moving. Water temp—10.4 degrees C., air temp—6.2 degrees C.

We camped about 4 miles west of San Telmo. Slightly cloudy. Moon in quarter. The night is not as cold as last night. We are also much lower (approximately 800 ft.).

Feb 1, 1949

Broke camp at about 10:00 AM after a rather illuminating conversation with a vaquero. He informed us that vibora de cascabel was quite scarce (poquito) in this area but was common upstream at the base of the Sierra San Pedro Martir. We drove out to the main road and up toward Ensenada.

At the old camp site we stopped (the first night's camp among the oaks)—23 miles south of Ensenada. We ate lunch here and commenced collecting. A skink (*Eumeces skeltonianus* probably) was caught. 2 *Gerrhonotus multicarinatus* were caught under stones, 1 adult and 1 juvenile, 15-25 *Batrachoseps attenuatus* were captured, 1 *Sceloporus occidentalis*, 1 *Uta stansburiana*, 9 *Aneides lugubris* were captured.

The ecologic situation was as follows: the Sanfransisquito Canyon? flowing in a WNW direction bisects mountains about 2,000 feet high. The flora on the upper portions of these mountains is very sparse and xeric. A band of oaks and associated chaparral elements extends along the mountains on the south side of the canyon. They are intermittent, being eliminated where spurs extend the exposed surfaces down into the canyon bottom. This oak band occurs on the stream's edge in some places and in others it extends up the slope 100-200 yards. In general it is not more than 50 yards wide. The stream bottom proper is a sandy wash and covered with scattered *Baccharis* and willow plants. An occasional *Sambucus* and *Lycium* also occur. The north bank has a band along its bottom edge of *Rhus laurina*, *Sambucus glauca*, an occasional scrub oak, and *Photinia arbutifolia*. The upper slopes have agaves, *Rhus*, *Lupinus*, *Artemisia sparsifolia*, *A. californica*, and a mallow.

In the oaks the following plants were noted: *Ribes*, *Rhus trilobata*, *Quercus agrifolia* and *Q. dumosa*, and *Photinia*.

The *Batrachoseps* and all the lizards were found in the moister habitats under rocks lying on the ground under the cover of large oak trees. The *Batrachoseps* seemed more common on fairly level ground. *Aneides*, on the other hand, was found in the more xeric portion in scrub oaks and *Photinia* among rock rubble at the base of a road cut where rocks had been used to make a fill. The soil was moist but not wet at point of capture.

The oak grove in which these animals were taken was about 200 yards long by 40-50 yards wide. The ends were much more xeric than the central area of large oaks.

We drove on up to Ensenada and found we could rent a skiff for both ways to Todos Santos Island for 15 dollars.

Birds seen: brown thrushes, *Pipilo fuscus*, San Diego towhee, juncos, myrtle warblers?, flickers, Cal. jays, wrentits, sparrows of some sort, band tailed pigeon. One *Neotoma fuscipes*? was almost caught.

Camped about 5 miles out of Ensenada on the Ojos Negros road. It is raining now and these notes are being written while lying prone in the back of the pick up by flashlight—Adios.

February 2, 1949

It rained all night intermittently. Broke camp about 10:00 AM and drove up the Ojos Negros road in an attempt to reach Laguna Hansen. The road was quite slippery with mud and 4 wheel drive was used most of the time

About 5 miles east of camp we drove to an isolated patch of oaks amidst chapparal. We rolled what rocks (piedras) were present and searched a little while but no luck. A Mexican said he did not think there were any there (no hay)

We drove on up and over a range of high hills and stopped approximately 16 mles east of Ensenada at Mina de Felicidad. A narrow band of oaks (*agrifolia*) followed the north-south stream bottom. The hills (palos) on either side are clothed with chapparal. Under rock rubble and in woodrat nests approximately 10 *Batrachoseps* were captured. The soil was moist and water was running in the creek.

We drove on (a cold and bitter day with some rain) to Ojos Negros, a cattle and farming camp on a flat valley edged with juniper. We met our first Automobile Club sign—one of the old blue variety. The valley is transected in many places by different unmarked roads that make navigation confsing. Once the proper road was determined (by questioning natives) we drove up a long low bajada through belts of joshua, ribbonwood, and *Rhus* to the small village of La Huerta (2 houses). The first patches of snow were just above La Huerta. We reached oaks about 5 miles beyond La Huerta. It began to snow while we were coming out. We drove back to Ensenada.

At La Huerta the surrounding mountains are rock covered (boulders of exfoliating granite) and look very good for spring lizard collecting. We camped about 15 (20 miles) or so north of Ensenada in a canyon of beautiful large oaks and sycamores.

It has commenced to rain again so Dick and I will have to sleep in the truck bed again—god help us. Chuck and Arlene are using the arctic tent. *Hyla* are calling in the creek. Soil Temp—5.5, Air—4.5, 7PM.

February 3, 1949

The situation here (20 miles north of Ensenada looks ideal for *Aneides* but none were found. A series of 15-20 *Batrachoseps* was taken. The canyon is a rather wide one—approximately 150 yards, with a narrow gulley in the center in which the stream flows. Large oaks and sycamores cover the canyon bottom. The sides of the canyon are covered with chaparral. The oaks extend up into the tributary canyons and here the trees become smaller and smaller as exposure is increased, gradually merging into chaparral. A skink and 2 *Sceloporus* were taken under rocks. Soil temp—8 degrees C. The skink was just barely capable of movement. The weather is cloudy with occasional showers.

March 4-5-6, 1949

Panamint Mountains Trip

At about 5:00 PM on Friday, Chuck and Arlene Lowe and I left Los Angeles in my Willys Pick-up. We drove up through San Fernando and the Newhall gap and had dinner at Solemint. It had been raining over all the area covered by our trip the day before. Stratus clouds covered the area to the edge of the desert.

We drove up Soledad Canyon and captured a *Hyla regilla* (gravid), a *Bufo boreas halophilus*, and an *Ensatina eschscholtzi*, all on the road. The pavement was wet. Beyond the detention camp the new bridge has just been completed and now eliminates the only ford left on the road.

At Harold (aprox) the skies were clear overhead. We drove on to Mojave. No animals were seen on the road. We bought gas at Mojave and talked to a man named Brewer in the Associated station who knew George Pipkin at Wildrose Station. He had previously lived in Trona.

At Inyo Kern the Michelson laboratories and ordinance depot now cover a tremendous area (I would estimate 1,000 acres), and even at this time of night (10:00 PM approx) the lights were everywhere. What a tribute to man's overall sanity! The Trona Plant to the north has expanded considerably and now two huge units are operating—both were in operation when we passed.

A new road has nearly been completed over the Slate Range. We took a considerable detour over the old gravel two rut road. The new road is a good two lane macadam strip. Pavement has also been extended down Wildrose Canyon about 1 mile below George Pipkin's place and probably will be extended to meet the other new road.

We drove past Pipkin's past the park service summer quarters and up across a considerable sloping valley (about 1,000 acres) to the lower edge of the junipers, on the Mahogany Flats Road. Here we found snow. We turned around, just as it commenced to snow lightly and camped in the Summer Quarters Garage on the cement floor.

March 5, 1949

Arose 7:30 AM. We drove to George Pipkin's. He had a Panamint red rattlesnake that he had caught about 2 years before. We had left alcohol at that time. George said there had been 14 inches of snow in January at Wildrose Station. He had a pet pair of ravens and a burro.

We tried to drive to the kilns and were stopped about 1 mile below by snow that covered the road about 1 foot deep. We then drove down to Stovepipe Wells and to the duns. A short search revealed *Uta stansburiana* and *Callisaurus orc*[?]. Temperatures were taken and found to show that the animals were operating at the lowest part of their optimum range.

A *Cnemidophorus t. tessellatus* was taken (sub adult).

At the Park headquarters we saw Sam Huston and wife. He offered to guide us up Johnson Canyon to look for skinks in the willow thickets and cottonwoods that are said to occur there.

Following Sam and Chuck who were in a park pick-up, we drove down the west side to the valley past Trail Canyon (has a road up it), Hanapan Canyon (also a road), Bennets Well, and Shorty Harris' grave (Sam says they made Shorty's grave the length of Shorty (5 ft.) and neglected the fact that he was buried in a long coffin, thus he was buried on a slant head up). Just past Eagle Borax Works we turned up an unmarked and faint, two rutted road, over the sharp stones of the alluvial fan of Johnson Canyon. We

drove for about 5 or 6 miles up the fan on a ridge between two steep walled barrancas. We saw 4 burros in one group and 3 in another and one single animal walking on the almost completely barren bajada.

A few *Eriogonum inflatum* stalks were the only noticeable vegetation. Sam showed us where these animals had eaten a viznaya (*Echinocactus*). He said they kick the spines off the top and eat out the inside of the shell. Just at the base of the first foothills we dropped over the bank into the stream bed, went around a corner and reached the end of the road—some 5 or 6 miles below the springs and trees.

Here we met a Mr. Lucian Willard Gaskins, 1414 ¼ (about 30-40 years old), Mariposa, Los Angeles (6) and a long lanky gentleman known as “Mississippi.” The latter fellow was seemingly not too bright but very pleasant. Gaskins, however, was quite intelligent and seemingly a rather accurate observer.

We quizzed Mr. Gaskins about the country and fauna. He had a mill up the left fork of the canyon and was working silver and free gold with an amalgam shaker. The mill was still uncompleted according to him. He had hired Tom, a Piute indian who lived during the summer at the water in the right fork of Johnston Canyon, to haul his materials to the mill. This mill is on the lower edge of the juniper and at an estimated 7,200 ft. elevation. Gaskins showed us a copper deposit he was working (a fissure vein). He said it had assayed 19% copper, 12% zinc, and the deposit was ½ way up a spur directly across the canyon from the road’s end. The vein was about 18 inches across and extended about 100 yards in strike. The surrounding rocks were metamorphics.

Gaskins described finding “small, brown, spotted animals in the rotting pine logs high up on the ridge above the head of the canyon (Johnston Canyon). He showed us a picture of a salamander in Prisson and Schuckeits *Historical Geology* text, which he had in his mobile cabin. I asked him if the animal was under pinon logs—he said “No, these were green pines and I was using the rotting logs for firewood.” This probably means limber pines or foxtail pines, which occur above 8,000 ft. on the mountain. He had found them near a half completed log cabin built years before. It will be May before we will be able to reach these pines. Tom, the Piute, mentioned finding them while picking up pinon nuts as a child, at Mahogany Flats.

Gaskins mentioned picking up “little gem crystals” in the tuff mounds back of the regular Park headquarters near Furnace Creek. He said they had to be washed out of the matrix. We left Gaskins our names and addresses and some alcohol.

We drove out and left Sam at the junction. Sam told us that snow had fallen at Badwater and considerable had fallen at Furnace Creek. The snow had not stayed on the ground at Badwater. A 600 acre lake now covered the Badwater area.

We drove to Saratoga Springs being forced to use 4 wheel drive to cross the Amargosa River. On the old road into the springs we used 4x again for a long stretch. A new road greeted us as we swam up through the mire. It hits the road about two miles south of the old one. It was built in conjunction with a mine that is in operation in the hills behind the spring.

We caught 2 *Cyprinodon* in a potato sack net from the spring. They apparently rest at night by sitting on the bottom, scattered about—no groups were observed. They were much less wary than during the day.

Hyla regilla were calling everywhere—we caught several though they were hard to locate because of the dense papyrus-like rush, and pinnate leaved salt grass that looks like devil grass. Coyotes were heard—yapping out among the creosotes.

We ate a sumptuous meal of “instant potatoes”—a dehydrated potato mix that makes very tasty mashed potatoes and T Bone steaks.

We drove on to Baker and there asked about the road to Kelso through the devil’s playground. Most people don’t know. Those who claimed to said we couldn’t make it because of deep sand.

We decided to take the Windmill station road to Cima. This we did. We camped just south of the station about 11:00 PM. A Screech owl was heard cawling.

March 6

Arose about 7:30 AM. Proceeded to Cima. The New Yorks and Providence Mts. had scattered snow on their northern slopes. We then drove to Kelso—all on fine desert roads. At Kelso—from the General Store owner—we learned that 18 in. of snow had fallen during January. They were snowed in for about 2 weeks. The Devil’s Playground road could be seen cutting over a saddle to the north.

Kelso is a town of about 85 people supported by the railroad and a mine now in operation, in the Providence Range.

A large range of sand dunes probably 15 miles in length and 2 miles wide extends from the base of the north foot of the Granite Mts. up into the Devil’s Playground to the north. Peaks of sand (pure) probably 400 ft. high are prominent at the southern end of this sand.

A new paved road cuts out from the western end of Kelso and extends up into the foot of the Providence Range to the mine. A pile of gray ore about 100 yards long and 30 ft. high awaited shipment by the railroad. We drove the road to the powerline where we cut off the pavement to the right on a two rut road. This road was quite good and not sandy as reported on the map. It passes through the saddle between the Granite and Providence Mountains, over a bajada and around the northern end of the Marble Mountains to the west and hits the highway just east of the southern end of the Bristol Mts., about 2 miles east of Amboy.

We could see where hay had been dropped to the cattle during the snows of January. At Amboy the station attendant told us the horned lizards and grid iron lizards were out behind the town to the north. He said a sidewinder had been brought in by a Mexican 2 weeks earlier. It had been found under a pile of railroad ties.

We took the 29 Palms road. It crosses Bristol Lake on its northern end. The lake is being exploited for its salts. Many green settling basins lined the road, which is raised above the lake bed by a dirt fill.

The Coxcomb Mountains, to the east, are covered with blown sand and may harbor *Uma*. A small patch of sand was noted on the north end of the Marble Mountains.

The road (a good wide dirt road) leads over a gap in the Sheep Hole Mts. and down to Brush Lake (a salt lake with an extraction plant on its north side). About 1.7 or 1.8 miles after the road makes a right angle turn on the flat north west of the lake we cut off by an old ranch house through reddish dunes toward Old Dale. Several people including a lady (Schmidt) greeted us at the ranch. The dunes are much restricted and small. We saw 7 *Uma* and caught 4. They were all sluggish to a certain extent.

Using 4 wheel drive we drove through and hit a good road in about 1 mile. We drove on over to the Pinto Basin, catching 3 chuckwallas on the black rocks just this side of the basin.

In the basin there are no real dunes in the west end though the east end looks very good from a distance.

We ate dinner at Cottonwood Springs where we saw woodpeckers working the cottonwoods.

We drove out and down to the Blythe road and thence over to the All American Canal where we took the road bordering the canal and then cut off on the Powerline Road (paved after a fashion) to Pushawalla Canyon. This canyon is just opposite a ranch with a airplane beacon on it. It is about 2 ½ miles south of the 1,000 Palms Oasis Road. We cut up Pushawalla Canyon and observed bats, *Bufo punctatus* not calling very often), and *Hyla regilla* (calling constantly in great chorus)—1 pair of the latter was in amplexus. *Myotis* and *Pipistrellus* appear to be the bats seen. We drove out and home by way of Redlands.

The Coachella was literally purple on the slopes east of Indio with *Abronia*. Various *Oenothera*, chia, *Lupinus*, *Coreopsis*, and *Dalea* were in vigorous bloom. The fouquieras were in leaf and just about ready to bloom in this area. One mallow was seen in bloom.

March 12, 1949

Left Van Nuys at about 7:30 AM. Drove on to Covina Knolls (the hills on eastern edge of West Covina). I stopped to investigate a rather open oak woodland (about 25% cover). The oaks were quite large and were intermixed with a few California walnuts. This latter tree is quite abundant in some locations on these hills.

The hills are rounded hills of sandstone—most of ground surface is covered with soil. The understory is almost entirely grass with an occasional poison oak plant.

Batrachoseps and *Aneides* were found under logs (see species account)

Drove on uneventfully. The sky was overcast the whole way changing from stratus to cumulus as I neared Banning. At Banning the skies were clear. On the desert the skies were clear and in some places (particularly the lower San Gorgonio wash) a brisk breeze was blowing.

1 mile NW of the Riverside County line on Hwy. 99 I stopped to inspect some oaks. These were more depauperate than the last though probably no younger.

They lined the steep south western bank of a stream from the foothills of San Gorgonio Peak. The oaks clung to this north-facing slope only. The more exposed locations were chaparral covered. It is a marginal situation for oaks as they are no longer in evidence 1 mile south on Hwy 99. *Batrachoseps pacificus* were taken.

Drove on through Beaumont and Banning and stopped at eastern edge of Snow Creek alluvial fan where it touches the Palm Springs Road. A considerable wind was moving some sand. The wind was from the direction of Banning. One juvenile *Uma*? was seen. *Isomeris* and *Abronia* were in bloom.

Drove though Palm Springs. It is at the height of its season and then took the Palm Springs-1,000 Palms Road. At my study area no animals were seen. Sidewinder

tracks (medium sized) were noted on one dune. *Dipsosaurus* and *Canis* tracks were abundant. A juvenile *Callisaurus d. gabbi* was noted on the road.

Dune temperatures were taken at various intervals. I drove up Pushawalla oasis between my 2 PM and 4 PM readings. Lambda Sigma was en absentia. Instead a delegation of medical students from Loma Linda were in occupation. *Hyla* were calling.

Several tracks were noted on Microclimate Dune (2 miles west of 1,000 Palms on Palm Springs Road). They were probably juvenile *Uma* or *Uta graciosa*.

At the study area two oenotheras, a lupine, *Abronia*, and an unidentified white flowering plant were in bloom. Also a yellow composite was out. Plant samples were taken.

March 13, 1949

Arose about 7:30 AM. I had heard a clatter of hooves during the night. I looked around from my sleeping bag but didn't see anything at the time. I had pulled the pick-up in a little wash out that formed a cirque-like hollow about 5 feet high. There were hoof prints about 15 feet from the car. They were sheep tracks (in all probability those of the desert big horn sheep). I could see where the sheep had been frightened and had leapt. He apparently had come over the edge of the washout on a trail without noticing the car until he was right upon it. Up on top of the alluvium there were many tracks of all sizes and a fairly definite trail. All this took place about ½ mile below Paul Wilhelm's place in 1,000 Palms Canyon. The animals probably come down to drink in the stream that flows there. *Hyla* were calling.

I drove down and completed my microclimate work

In a wash about 1 mile west of the study area I noted 3 *Uma*, all juveniles and sub adults and 2 *Callisaurus* juveniles. All these animals were on dunes accumulated around the base of large *Chilopsis* bushes. In these dunes were many burrows that look like *Dipodomys deserti*. On the flats around these hillocks were burrows of gophers. These are the only gopher burrows I have seen in the area.

2:00 PM. I drove toward Indio Hills on the Chuckwalla Ranch Road (about 4-5 miles south of 1,000 Palms). There are some very fine mesquite dunes here (2 miles off of Hwy 99). Many tracks were scattered over the sand. They were either *Cnemidophorus* or *Dipsosaurus*. One *Uta* was seen. Mammal tracks were especially abundant. *Dipodomys*, *Lepus*, what might be badger, coyote, and paisano (road runner) tracks were all common. Desert fox is probably here. *Abronia* is in bloom and makes the dunes purple.

I drove back to 1,000 Palms-Palm Springs Road. I drove the pick up out over the sand dunes. It works like a charm. An adult *Uma* or subadult *Dipsosaurus* was seen but disappeared.

2:30 PM. Two sidewinders were captured in the center of *Larrea* (see species account). I then drove up through San Gorgonio Pass (see botanical notes) taking notes and botanical samples every mile, starting at north side of Chino Canyon alluvial fan. Sunday evening wildflower traffic was so thick that it took over ½ hour to get through Banning.

Arrived home about 10:30 PM.

March 28, 1949

Trip to San Francisco-Reno-Death Valley

Crossed over to Scotty's Castle from Goldfield-Beatty Road on a good desert road that crosses a playa at one place. Grapevine canyon, in which Scotty's Castle is located, has considerable flowing water at two places. One location is about 2 miles upstream from the castle, the other is at Scotty's. Mesquite is common at both localities. The upstream patch has been badly burned. No frogs were heard calling.

I drove up to Ubehebe Crater at the north end of the monument. It is a crater about 100 feet deep in a series of lava hills that run north and south. The hills are covered with a black lava gravel. Few large pieces are in evidence. In the crater, sedimentary strata are evident and show the reddish color produced by heating.

On the east side of the valley, across from Ubehebe crater is Grapevine Springs, a series of seeps and trickles running down and over a sloping bluff of whitish soil (tuff?) for a distance of $\frac{1}{4}$ mile. Some cottonwoods are present and much mesquite and saltgrass is evident. I did not get close enough to look for frogs but the locality looks good. These springs are about $\frac{1}{4}$ mile east of the road

Just south of Scotty's cut off on the main road running the length of Death Valley the Mesquite Springs road cuts off. It runs down, 2 miles, to the central drainage of the valley. The spring is located in a group of huge mesquites (25 ft.) just above and to the east of the main wash. The small flow makes a stream about 1-2 ft. wide and 1-2 in. deep. The water is good. No frogs were seen or heard.

In one of the mesquites a pair of interesting birds was seen. The male was slightly larger than a blackbird, had a heavy grossbeak-like bill and a lemon yellow head and nape. The rest of his plumage was black except for two staggered longitudinal white bars on his wing. The female was smaller (slightly smaller than a blackbird) and had a streaked gray, brown, and white coloration overall.

Leaving the spring I dropped down the steep alluvial fan from a height of 2,000 ft. approximately to sea level at the Stovepipe Wells Rd. I drove on down to Furnace Creek where I ate dinner. The water is flowing swiftly in a rush-bordered ditch. There are 1 or 2 basins but no amphibia were seen. After dark I drove to Shoshone and camped about 15 miles south of this town. It was very windy and slightly overcast.

March 29, 1949

I arose at about 7:30 AM—still very windy. I drove over Ibex Pass and turned east on an oiled road that led up the Amargosa River at its southern bend. After crossing an extensive bajada the road turns down into the canyon of the Amargosa. The steep bands of the wash are lined with a string[?] of blown sand that extends for a considerable distance down the stream. Desert lilies were in bloom on these sand slopes. Their long crinkled leaves look very similar to the amole or soap plant of the chaparral.

They sported large white blossoms about 2 in. across. One lizard was seen. It was either *Uma* or *Callisaurus*, probably the latter. At any rate it escaped down a rodent burrow in the sand.

Borax mining is taking place up the canyon. An ore truck passed and many pieces of white ore could be seen along the roadside.

The bed of the Tonapah-Tidewater railway crosses the canyon about $1\frac{1}{2}$ miles up from the bajada. On a bench (40 ft. above the stream) of very sandy gravel about 300-

400 yards south of the stream bed lie a series of large sand dunes. They are nearly 400 ft. high in this spot. The dunes lie in a crescent around the northern end of a large valley with the remnants of a playa in its center. This crescent is perhaps 10 miles in extent. It is approximately $\frac{1}{4}$ mile wide. On its western end lie the 400 ft. dunes, piled up on a black volcanic hill.

I drove up across the bench to these dunes, having much trouble with changing the 4x drive in the midst of a sand storm.

I climbed one face of the dunes. At various levels, one only 10 feet from the top, the sand is quite hard and compact and does not give when you walk on it. Its crossbedding is evident. In between these hard bands the sand is quite soft.

On the north slope in some places, there are scattered *Franseria* bushes with an occasional *Larrea*. In this sort of locale I spotted and caught an adult and a juvenile *Uma scoparia*.

In a sandy wash near the main road below these dunes I shot a male *Callisaurus*.

No sand dunes were seen between the aforementioned locality and Baker, though sand is present on the hills on the west side of Silver Lake.

At Baker I drove toward Kelso on the Devil's Playground Rd. It leaves Baker just to the west of the Union 76 Station. The road was good as far as I took it. I drove home from Baker by way of Barstow. At the south edge of the Cronise Dry Lakes are some fine large mesquite-*Chilopsis* covered dunes. One *Uta* was seen.

All along the Mojave River sand dunes can be seen. They are particularly good 22 miles east of Barstow and at Dagget. The rest of the trip was driven in darkness. No incidents.

April 5, 1949

Departed for the Colorado Desert at about 11 AM. Drove through Redlands. Skies were completely overcast though the day was warm (75 degrees F.) Over the desert the clouds were thinner but still blocking sunlight. The sun was sometimes visible.

Keith Powell and I drove out east of Palm Springs about $1\frac{1}{2}$ miles and then down a wash.

3:30 PM. *Uma inornata* was seen in a *Chilopsis* that had accumulated a fairly large barchane[?] around its base.

4:00 PM. *Uma inornata* (adult female) taken in *Larrea*. The animal was not as active as I have seen them in July. *Dipsosaurus* tracks were much in evidence though no individuals were seen. They may have been out in the morning.

Dipodomys tracks were everywhere. Fresh burrowing of *Thomomys* were observed in the wash on the lee (downstream) side of *Chilopsis* plants. *Abronia*, *Encelia*, *Oenothera*, a yellowish composite, a legume (*Astragalus* or *Lupinus*) with inflated pods—were all in bloom. I dead adult *Dipsosaurus* was seen $\frac{1}{4}$ mile east of 1,000 Palms Junction.

At about this point and for $1\frac{1}{2}$ miles farther east along the road (1,000 Palms Oasis Rd.) a species of black caterpillar was seen crawling all over the road. They were about $2\frac{1}{2}$ in. long with a single spine on the tail. The animal was black with reddish dottings along its lateral edge. The spine was orange. They were feeding exclusively on a white flowering plant.

We drove up to the Powerline Road and east to Pushawalla Canyon and up the wash to the oasis. *Hyla* was calling. A few *Bufo punctatus* could be heard (see species acct.). The water was quite low.

6:15 PM. A *Sceloporus magister* juvenile was running among the roots of a palm—even though the sun had set below the canyon walls for some time. Hrs B.T. 22.4 degrees C.

Bats were noted flying down for water at the main pool shortly after darkness came.

11:15 PM. 2 *Pipistrellus hesperis* were shot BT 34.8 (fallen in H20) and 36.0 degrees air at 5 ft. 23.18 degrees C. Retired after observing *Bufo punctatus*.

April 6, 1949

8:00 AM. Arose to a cloudy sky. Cooked breakfast (bacon and eggs) and drove down the canyon and out onto Powerline Road where we turned south. We drove up on embankment of All American Canal. Just before we reached the Desert Center-Indio Road (9:00 AM) we stopped to investigate some large dunes covered with mesquite and *Larrea*. Sand verbena was in bloom everywhere as was *Larrea* and *Oenothera* (the large white one). Tracks of *Dipsosaurus* and *Dipodomys* were numerous. The sun was covered. One *Callisaurus* female was shot in the mesquite.

10:50 AM. The sun came out and so did the *Dipsosaurus*. Keith began to see them all over. They were mostly in partial sun under *Larrea*. One juvenile (subadult) was seen but he escaped down a hole. All specimens were in the near vicinity of holes and 3 or 4 escaped in this manner.

There are many large burrows, probably of the kit fox or badger in these mesquite dunes.

Dipodomys burrows are everywhere. Other specimens of *Callisaurus* were shot. Both Keith and I were panting for something to drink so we picked up a quart of Pabst (33 brews in one) beer at Coachella (12:00 Noon) and had beer and peanut butter sandwiches under a cottonwood tree.

After lunch we drove to Truckhaven (the car had begun to heat up), stopping at Travertine Pt. Where we caught 2 *Dipsosaurus* and saw *Callisaurus* and *Cnemidophorus*. Both of the latter were so alert that I couldn't even shoot them.

2:30 PM. 12 miles south of Truckhaven we stopped because the car was at 212 degrees F. It was fortunate as the area was one of sandstone hills (numerous large concretions) covered in many places by drifting sand. *Larrea* was dominant though quite sparse. The sand has a pink tint to it.

2 umas were caught, both having three internasals and the ventro-lateral blotch—both were male and showed the ventro-lateral red color. *Dipsosaurus* was seen here.

We drove on south and up Hwy. 78 to Borrego Cutoff. The ocotillos were in leaf and many were in brilliant red bloom.

5:00 PM. At Borrego Springs we filled up with water (very good) and drove up to Borrego Palms Canyon. It is a mile hike to the palms from the end of the road—we did not hike it but turned around and drove east on a paved road, past the schoolhouse, turned north about 2 miles east of it and drove to the base of a small group of mountains.

6:00 PM. Here there is a sign saying "Peg Leg Monument and Clark Lake Airport 3 miles". We took the latter road (now dirt) over a saddle of alluvial material

(apparently burying a low ridge). This saddle is *Larrea* and *Franseria* covered. It is rather gravelly and seems to be of such a type of soil that *Uma* could not occupy it

The road drops down onto a playa (much mud cracked and not good driving in most places). This playa is about 3 miles wide. On its northeastern edge the road divides—we went straight ahead and then turned east a little later—bringing us into an abandoned ranch composed of a 3 room house (fair condition), a storehouse, and a very small bunkhouse, not to mention coals and 3 old auto bodies. A pump is in the center of the houses. After a few gallons of rusty water it gave forth with some very fine, reasonably cool water. The water is close to the surface as 1 or 2 pumps brought it up.

Mesquites are all around the ranch as are some rather large sand dunes. These dunes form a semi circle around the northern side of the playa. The lake is in a drainage-less basin of quite limited extent being about 10 miles long by 5 miles wide. The foothills of the Santa Rosa Mts. form the northern enclosing range.

6:45 PM. We ate some Vienna sausage and bread and started to drive the roads. Almost at once we came upon a large sidewinder (15 rattles) that was travelling toward us. Keith was properly amazed at the motion of his first sidewinder and realized why I was unable to explain how they moved before. We drove to Borrego Palm Canyon and back, catching 6 sidewinders, an *Uta*, and 1 *Coleorynx*. I was fooled twice by the same “Klauber Snake” which turned out to be a tea bag.

It seems a little cool yet for most species to be out. Back at the ranch we coked some clam chowder and coffee (the most concentrated stuff I ever tried to drink—even including that Lowe makes at times)—diluted 5 to 1 it was still strong.

11:00 PM. Ceased activities in favor of the sack. Mockingbirds are calling in the mesquite. A nighthawk flew low over our camp.

April 7, 1949

Clark Dry Lake, San Diego Co., California

8:00 AM. Arose. Skies cloudy and considerable breeze blowing. We cooked breakfast and started out to hunt animals in the dunes nearby. At 10:00 AM the sun came out and so did the animals—*Dipsosaurus*, *Uma* (looks like good *notata*), *Cnemidophorus tessellatus*, *Uta*, and *Callisaurus* were noted.

The dunes are very heavily overgrown and make hunting exceedingly difficult.

This ranch is the “Rock Ranch” and was a homestead. Mr. Rock is now in Missouri.

The dunes stretch out and go up the eastern bajada for a considerable distance and may reach the top of the intervening saddle on its eastern curve. This may represent the route by which *Uma* reached the valley.

12:00 Noon. We drove toward the western end of the lake (about 3 miles from the ranch). The dunes are here also and thus form a letter C around the north, east, and west sides of the lake with a sandy gravel bajada on the south side. There are signs of an old abandoned ranch under a few large *Casuarina* trees on this west end. *Uma* was taken here. A Cooper’s hawk was seen flying with a small mammal (probably an antelope ground squirrel or gopher) in its talons. The bird was unable to fly very far and progressed in flights of 75 yards or so in front of the car.

2:00 PM. Drove out over bajada and stopped at some sand dunes in eastern part of Borrego Valley. I saw an *Uma* but did not obtain him. Caterpillars of the variety

mentioned before were seen eating *Abronia* and *Oenothera* (the large white one). In places they had devastated large patches of these plants. Individuals were seen burrowing in the sand. They formed a low domed burrow by bending themselves around and pushing the sand out with the side of their body.

These animals are black with three yellow lines—a continuous central one and two lateral disrupted ones. About 6 fine yellow punctuations appear on each side of the central line on each segment. The first three segments have pairs of horny feet. Then there are 4 blank segments and then 4 segments with soft sucker-like feet. Then a blank and a terminal pair.

2:00 PM. *Ocotillo, San Diego Co., California*

At Scotty's Café we had a talk with Scotty. He spoke of a road running from Squeaky Springs or Truckhaven that goes over the low ridge into Clark Dry Lake. Also he said it was in fine shape in places but required 4x drive in others.

The elephant trees, he said, may be reached by driving up Split Mts. Wash past the Strontium Loading Dock and going over a saddle to the north and dropping down into a sandy valley.

The well at Rock's is about 10 feet deep he says. Other places in Clark Valley, water may be reached at 30 feet or so.

We drove on to Westmorland and just south of Alamorio we saw a DOR *Pituophis catenifer affinis*. Fields were on both sides.

We camped just west of the Yuma dunes with lightning showing in the sky to the east of us but stars overhead.

Yuma Dunes, Imperial Co., California

Keith cooked hash and eggs and peas and coffee and coffee cake. Mighty soul satisfying around a fire of *Larrea* roots.

April 8, 1949

Yuma Dunes, Imperial Co., California

6:30 AM. Arose and cooked bacon and eggs. We then drove past Gray's Well about 2 miles from here.

8:00 AM. I stopped to photograph the old corduroy road where it crosses the main highway. The sand has shifted and heaved the planks up and torn up the metal strips that were bolted to these.

8:30 AM. A little farther down the road we saw a juvenile *Uma*. We stopped and caught 15 or 16 mostly juveniles.

We drove on to the east side of the All-American Canal and down a very sandy road on its east bank. Several umas were caught including some good sized adults.

We went swimming. The water is colored like weak tea but is nice and cool. The banks here are covered with reeds. The water becomes deep very rapidly and is quite swift in the center, it being about all I could do to make progress swimming against it.

We turned around and drove back but became very much stuck in a little rise of soft sand about 100 yards off the road. Keith and I tried everything—digging, jacking the car up and putting *Larrea* branches under the wheels, digging ruts, wetting the sand, and finally we crossed the road and found a section of the old plank road. We ripped off two

planks and hauled them about 200 yards to the car. At this juncture another jeep pickup came along.

2:00 PM. He pointed out that driving in sand is easier if the tires are soft. Both Keith and I felt like complete fools as we knew this but neither of us had thought of it. With the planks and soft tires the jeep went out easily. We were so hot and sweaty and hungry that we ate lunch and took another dip under the bridge.

We shot a Mexican free tailed bat that was hanging on a mud dauber's nest under the edge of the bridge. BT 29 degrees C. Air Temp 28.9 at 5 ft.

We drove to Winterhaven stopping by for a beer and some groceries. We drove up to the gravel pit on the Picacho Rd. We were going to camp but left shortly after Keith returned from an unsuccessful fishing venture in the All American Canal . . .

Winterhaven, Imperial Co., California

. . . because of mosquitos. Quail were noted in lush mesquite and palo verde. Nighthawks were seen winging down from the hills toward the Colorado River.

We drove on toward Picacho on a good dirt road for about 10 miles and camped in a wash under a large ironwood tree. Skies have been clear all day and the weather warm.

We cooked a dinner of coffee, meat cakes, corn, milk, raisin bread and jam, and peaches. This we ate alongside a nice fire of ironwood logs.

8:00 PM. We are both tired as dogs and should sleep well as there are few if any mosquitoes here.

April 9, 1949

Picacho, Imperial Co., California

6:30 AM. Arose and cooked breakfast. We drove up the Picacho Mts. over a very rocky road. Just at the summit of these mountains along the road is a rock shrine to E-vee-taw-ash. She was an evil old indian of the Yuma tribe who changed herself into a mountain and demanded gifts from all travellers passing by or she would wreak havoc with their party.

The mountains are very rugged, being composed mostly of lava and much dissected by erosion. The surface of these hills is a sea of rocks about the size of a soft-ball. A little farther we passed the Picacho Gold Mine which is still operating. It is located on a fairly level area at the eastern foot of Picacho Pk. This peak is knife-edged and has vertical cliffs on both east and west sides—near the top it is very thin, being pierced in one spot by a hole about 40 feet below the summit.

Picacho is a settlement of 5 or 6 buildings including the ranger's headquarers. He is in charge of the game refuge there. Mesquites and palo verdes are very lush as the town is situated at the edge of the Colorado River on a flat.

Two lakes are formed by waters backing up behind Laguna Dam—the northern one is Taylor Lake. There seems little possibility that the Colorado could have followed a sandy course through this area.

I hiked back in the hills behind Taylor Lake and secured *Cnemidophorus* and *Dipsosaurus*.

2:00 PM. Having had no luck fishing but a strike on a juvenile *Uma*, Keith and left for Winterhaven where we found that the generator had broken loose and thus

loosened the fan belt thus accounting for the heating of the car. This was fixed and we drove to Ogilby and Midway Well.

Midway Well, Imperial Co., California

6:30 PM. The water at Midway Well has been piped to a faucet. It is fine water. The Ogilby road rises from Ogilby over a low saddle in the Chocolate Mts. and drops down into a broad mesquite, ironwood, and *Larrea* covered wash in which Midway Well is situated. We camped about 1 mile north of the well.

April 10, 1949

Midway Well, Imperial Co., California

8:00 AM. Arose and cooked breakfast. We drove down across the wash and down to Davis Lake. It is a small area of backwater along the Colorado. The gentleman who runs "George's Camp" there was very helpful (he smoked a large meersbaum pipe that was so heavy he had to hold it with one hand all the time).

He showed us *Dipsosaurus* and *Cnemidophorus* along the river bank. His dog "Princess" was a good lizard hound.

We could not navigate the road direct to Palo Verde as it was swampy so we went back to the Midway Well Rd. and over the Barren Mts. Grade—a very rough road and down into the Palo Verde Valley. A bluff runs along the west side of the valley. It is of 2 levels. The lower level is faced with sand. The upper level in 2 or 3 miles further west. They apparently are old river banks.

Palo Verde Valley, Riverside Co., California

A good pinkish sand deposit lines the slope in places.

We had a swim in an irrigation canal and started home (6:00 PM). On the south side of the road about 20 miles west of Blythe is a deposit of sand. Palen Dry Lake is circled with sand on its southwestern border. We reached Desert Center at dusk and ate dinner.

A drive along the aqueduct road proved fruitless except for a single *Coleonyx*.

The day had been clear and hot and the moon was nearly full. We reached home at 1:00 AM.

April 16, 1949

11:30 PM. Arcadia—in front of "Arcadia Tots to Teens Shop."

An idea has been growing in me since I heard a Sigma Xi lecture on "Life on other Planets" by a distinguished English astronomer.

I am privileged to wonder. This is a great privilege. Of all the billions of stars in our galaxy a few certainly have solar systems. In our own solar system Mars and the earth alone are capable of supporting life. On Mars it is a mere rudiment. The conditions for life are very special—the proper size of the planet so noxious gasses may escape the force of gravity, proper moisture contact, proper distance from sun to allow heat, even the tilt of the earth must be considered.

Life as we know it must be ephemeral at best as it is fostered only on planets of gravity that is such that the atmosphere is gradually being lost. Thus life on any planet has a life of its own.

Of all the vast quantity of stars and planets in the universe only a few could satisfy these conditions. Of these few life need not have emerged on all. Since life itself has a span it could not exist on many of those so particularly situated that they are susceptible to the condition of life. Thus of all the vast and unknowable “quantity” (the word seems to have no meaning here) of material in the universe only a completely miniscule portion of it could take part in life.

In life there are infinite arbitrary divisions. Its variability is prodigious. At one end of this spectrum, forming a very minor part, even on our earth—is man. A creature such as man certainly must have been conceived on many of the planets ripe for life. Within the species man the group is rife with gradations.

The great masses are lead by faiths that are not of their own construction but heresay instilled by repetition and fear. A few of the leaders have conceived a faith that is their own but few have passed on a faith. Among the led life is taken for granted as in all lower animals from protozoans upward. A few minds have wondered at life but how few? Even of the group of humans working with life—biologists, botanists, zoologists, philosophers—only a few do not take life for granted.

Therefore—the few who wonder represent the most special class imaginable—even among living things. The number is growing. Humans such as myself must have facts before we can wonder and the facts are being viewed by more and more people. However, before science the men who wondered must have been remarkable indeed.

A painter and a Mexican laborer just walked past on the side walk. I doubt that they wonder at thought or at feelings, or sight. Do they ever wonder what it is that they see?

My own privileged position was purely a matter of chance. There are a thousand courses I might have taken where I never would have wondered.

A sugar molecule, taken into the body is assimilated, burned, and excreted. It never changes into a living thing. A perfectly homologous reaction can be reproduced in a test tube. Where then is life—the thread about which we wonder? It lies in the use of the energy produced from the molecule. In the tube the energy is expended into the air. In the organism it is controlled and used in the organisation that is life.

The mystery lies in this organisation that is the exact antithesis of physical phenomena. The observation of the devious paths this thread or organisation follows to maintain itself against the completely inert but all consuming suction of things physical, is a most remarkable pastime.

Life is at times new, then vigorous, and then senescent as the organisation leaves and the matter is once again physical. To think that I, in the face of all these before-listed special categories, find myself in a position where I may wonder and be amazed at the remarkable physical universe and the even more remarkable manifestations of that universe makes me say that “I am privileged to wonder.”

April 17, 1949
Pushawalla Palms, Riverside County, California

Last night I left Van Nuys at about 10:30 PM. Arrived at my study area at about 2:00 AM. A misty fog covered most of the skies between Glendale and Beaumont. A cold wind was whipping up San Gorgonio Pass and was most evident to me as I was driving an open University jeep. At about Cabezon the moon started to light through the clouds. By the time I reached Snow Creek wash there were clear skies overhead though the air was cold—blowing down off of Mt. San Gorgonio. Bushes were whipping until Chino Canyon was reached. By the time I reached the study area (3 miles east of Palm Springs on 1,000 Palms Road). The air was warmer and only fitfull gusts of wind came by. “Hit the sack” at once.

Pushawalla Oasis, Riverside County, California

8:00 AM. Arose in a much dazed state, dragged over to the microclimate barchane and took my first readings. After this I set out the lead trap in my study area and drove to Whelan’s Drug Store and ate breakfast.

During the day I marked 3 *Dipsosaurus* burrows and excavated another (an old *Dipodomys deserti* burrow). An *Uma* was seen perched on a rock for the first time.

I drove to Indio and bought a pair of khaki pants as my pair had just given out.

At Thousand Palms I bought some chow and said hello to Mary Hicky then I drove up to Hidden Springs to Mr. Doyle (Charles). He was in Los Angeles.

I then drove up to Pushawalla. The entrance is even more obscure than last time I came up. You drive south along the Powerline Road—from the Thousand Palms Road until you just past a ranch surrounded by *Tamarix* about ¼ mile to your right. There is a large aircraft beacon on the southwest corner of this ranch. The Pushawalla Road is the third dirt road going up into the Indio Hills. The first is an extension, across the Powerline Road, of the ranch road leading to the beacon. The second road leads to two houses set on the base of the Indio Hills. The third, the Pushawalla Road, turns back at greater than a 90 degree angle and goes up the canyon. It is very sandy as are the other two.

While driving up the wash I could see a sea of clouds in San Gorgonio Pass, filling it completely about 1/3 the way up Mt. San Jacinto. The end of these clouds was so abrupt that it looked exactly like an enormous snow bank.

April 18, 1949

17 Palms Oasis, Imperial County, California

8:15 AM. Pushawalla. Arose after a much needed good sleep. The wind has abated since last night but the skies are clouded over and the air is cool. I packed all the 15 *Bufo punctatus* and 12 *Hyla regilla* that I took last night and prepared them for express. Then I ate breakfast and drove down the wash. To the west of Thousand Palms I stopped to mark the *Dipsosaurus* burrows I had noted yesterday including that of the marked animal that was released 70 yards east of his home. I used 3 1 gallon square cans as markers. 2 burrows are on the south side of the road about 100 yards and 150 yards east of the railroad tracks. The other is on the north side and right near the metal railroad sign.

9:15 AM. At my study area I retrieved the trap that had been set. It contained 4 caterpillars. The wind had blown my lead fences all around. Then I drove to Indio

through all the date gardens (Cathedral City-Indio Road). The package was expressed at about 11 AM. The express man asked no questions about water and I told him nothing.

Stopped for gas at Union Station. The attendant is a rock hound and was interested in all my plunder.

I drove south on Hwy. 99. 5.3 miles south of Coachella I turned right and headed toward a line of white sand I could see lying over against the hills. On one road I drove while trying to reach the sand, the dust was so thick that I had to stop the car in order to breathe or see.

11:20 AM. Needless to say, everything in the jeep was covered with dust and all day long, as soon as a wind would come up, clouds would arise from inside the ???. This must have produced a curious effect on some of the paved roads I drove.

Finally, I drove over an irrigation ditch on a rickety little bridge and past an abandoned adobe ranch and up a wash to the sand which proved to be an ancient beach of unsorted (by wind) sand. The sand abutted right on the rocky foot of the mountains and no *Uma* were found nor were any expected as the sand was wrong, it was isolated, and during inundation offered no habitat above water level for *Uma*.

This is apparently the case all the way from La Quinta to the southern base of the Santa Rosa Mountains.

12:30 PM. Sun came out. The beach line is clearly evident along the base of the mountains here because the rocks that have been covered by water have travertine over them and are rounded. The ones above water level are fresh, clean, and angular. The rocks below the line are brown while those above are gray.

Recession of the waters must have been rapid as the main beach line is well demarked and beach formation and wave action is evident. The recession levels are marked by very much fainter lines made most evident by plants growing in parallel rows along them.

While inspecting these marks I found a dirt road following the foot of the mountains. I drove southward along it and found that it lead to "Ancient Fish Traps" which must have been near my beach as that is where the road leads.

1:00 PM. I did not see any traps. This road leads out to the road connecting Hwy 99 with Mecca. I crossed it and continued on south along the base of the mountains, ending at last in the mouth of a rocky canyon. Seems that there was no possibility of sand dunes, even though I was above sea level. I turned and drove down a sandy wash and came out on the west side of a row of *Tamarix* trees lining the west fence of a ranch. Once more on the Mecca Road, I turned on 99 and drove to Travertine Pt. stopping on the way for lunch and a brief[?] turn off on Dr. Forbes Ranch road. The beach line is evident here too but there is not much sand and none above sea level. I caught a big male *Dipsosaurus* here. The area is a bajada covered with a most[?] lush growth of ocotillo. All in bloom or leaf or both.

2:00 PM. I drove up a wash for a distance but the sand hummocks soon gave out and turned to gravel and rocks. *Callisaurus* were common.

At Travertine Pt. I drove up a sandy road on its north side (200 yards north) over to a patch of blown sand lying just at sea level on a foot of the mountain made of travertine covered boulders. This sand is about ½ mile west of Travertine Pt. proper. *Dipsosaurus* and *Cnemidophorus* were seen but no *Uma*. I doubt that any of the sand at

Travertine Pt. supports *Uma*. I drove over the barrier beach behind the point and down to the old road and on it till Hwy 99 was reached.

At Truckhaven I took a road to the right marked "Closed to Public Travel" (Road Dept. sign). That leads to the Caucote Mine. For about 8 miles it was a good gravel road following stringers of the old surface of a now dissected alluvial fan. Then it dipped down very steeply into a baranca (about 80-100 ft. deep) and went up the other side (north side).

3:30 PM. I could see a shack sitting on the side of a yellow hill in a very rugged situation in the Santa Rosa foothills but the road was so badly washed I turned around and went back to Truckhaven.

Going south on Hwy. 99 Arroyo Salada is crossed just before you reach Squeaky Springs Station. I drove down the arroyo and headed west. Following the main wash left, I followed the main stream bed all the way. Only once did a bed of equal size enter the one in which I was driving. I kept left at this juncture. The wash is generally wide but sometimes narrows to 40 feet or so. On either side are banks, usually vertical, of old muds and alluvial material. All seem to have a pinkish cast. These banks are no higher than 20 feet. ___ miles from Hwy. 99 I passed a little surface water and a lone palm tree growing on a little shelf.

4:00 PM. Some blown sand lines the edge of this wash in various places. The sand of the stream bed gets increasingly whiter as you go upstream. At ___ miles from Hwy. 99 I passed a 100 ft. hill with a cross on its top. Passing south of this I could see palms ahead. It was 17 Palms Oasis.

The oasis lies in a bend in the wash. A nearly level shelf occupies the south bank. At its edge it slopes downward about 5 ft. into the wash. The other bank is a vertical one of water cut mud stones and alluvium. At the edge of the shelf stand in a broad arc 28 palm trees, 18 of them of good size (including 1 dead one). The larger trees show burned trunks though some good skirts are in evidence.

Water seepage is evident along the edge of the shelf by a stand of salt grass. A few bushes of sedge are present. *Lycium* is growing in various places.

4:40 PM. The ground is covered with salt. A hole has been dug in the shelf and is filled with potable though highly mineral water. The seepage is very slow as the flow only extends 4 or 5 ft. from the hole. A benchmark at the SE end of the grove says 410 ft. elevation.

The wind has come up and is blowing my pots and pans around. I ate a whole can of spam—god rest my soul.

April 19, 1949

5:30 AM. Arose before daybreak—ate breakfast and was off. Backtracked down the wash 200 yards and drove up the main wash. It started to get quite rocky. 2.8 miles beyond 17 Palms a road entered the wash on its left bank. It was a good dirt road! After about .3 miles it dropped into another wash. I drove up the wash about .5 miles and cut up a west bank and drove down hill. I ran into the road again—apparently the approach to the stream bed has been washed away.

6:00 AM. Once again on the road, it lead over the divide and down into Clark Lake Valley. The road is the Old Doc "KahRah" road. An *Uta* was seen out at 6:30 AM.

It seems impossible that *Uma* could have entered Clark Valley from the east as it is rocky, much dissected and eroded mud hills and badlands. There is no sand along the base of the Santa Rosa Mts. in this area except in the lake proper.

I hunted for a while at the Rock ranch, reaffirming my observation that *Uma* (at least juveniles) does not match its background but is pinker. I washed up at the pump and left.

The barrier to Borrego Valley could have been easily crossed and is probably the source of *Uma* in the Clark Valley.

Callisaurus, *Dipsosaurus*, *Uma*, and *Cnemidophorus* (*Phrynosoma*) were cavorting on the road in Borrego (see species acct.).

Borrego Valley, San Diego, California

10:00 AM. I bought gas at Borrego and drove out to Ocotillo and Kane Springs. I then went to Westmoreland and Calipatria and Niland.

1:00 PM. A large red racer was seen crossing the road at Calipatria.

I drove up the Blythe road from Niland in search of the All American Canal Road, on which I hoped to reach the north end of the sand hills. No canal could be found. It must be underground. I backtracked and followed south a road on the east side of an irrigation canal. About 2 or 3 miles down this road it crosses the canal. Another road cuts out to the east instead of crossing. I took the east road which presently began to follow the railroad. After a bit the All American Canal appeared and the road followed the west side of it. At the dunes I was able to cross over to the east side and hike around the dunes.

Sand Hills, Imperial Co., California

3:00 PM. *Callisaurus*, *Dipsosaurus*, *Phrynosoma m'allii*, and *Uma* were taken—all matched their background. The lateral spot on *Uma* is somewhat washed out. A peculiar pincushion shaped plant was noted. It is completely buried except for the top. It has a circle of purple flowers and a long foliaceous stem. I think it is parasitic. Maybe Orobanchaceae? (It is *Ammobroma*, a member of the family Lennoaceae, and is cooked like a potato (tuber and stem) by the Indians.)

I then drove up to Mecca. The east side of the Salton Sea looks like the invasion route for *Uma inornata* because of its low relief above sea level.

Drove to Morongo Valley and over to Old Woman Springs and camped at Cottonwood Springs. Everything is filthy and incredibly dusty.

April 20, 1949

8:00 AM. Arose and drove in towards Palmdale. I took the Lucern Valley road going to Sidewinder well. There is considerable alfalfa farming on the borders of Lucern Dry Lake. On the NW edge of the lake there is very limited area of poorly sorted gravelly sand. No lizards of any kind were seen though tracks (probably *Cnemidophorus*) were observed.

The road goes straight up a thin wedge shaped valley. At its northern end I picked a *Crotalus scutulatus* off the road. He was sunning. At the apex a road goes to Barstow and one to Sidewinder Well. I took the later and found no sand deposits of any sort on the rest of the road to Victorville.

9:00 AM. At Victorville I bought gas, drove 2 miles north to the Adelanto Rd.—took it toward El Mirage Dry Lake.

El Mirage Dry Lake

9:30 AM. El Mirage Lake is a playa rather distantly rimmed by low buttes. It is circled on its west, southwest, and northwestern sides by much vegetated hummocks of sand. No *Uma* were seen though they may well occur here. *Callisaurus* was taken.

I drove on past Black Butte and Three Sisters Butte to the Llano cut off, which I took. At the Cottonwood Store I bought 6 bottles of Schlitz and went down to the powerline and met Dr. Epling and his Linanthus crew (Dale Steffanson, Paul Levine, Chuck Lowe).

We finished the transect by noon, drank the beer, drove to Pearland, and ran his (Dr. E.) circles for him. Then we ate lunch (quarts of milk and pie), drove west of Palmdale, and ran another series of circles. A new [?]1,000,000 well has been drilled here. Water was hit at 300 ft., and drilling continued to 600 ft.

Palmdale

2:30 PM. Chuck and I left Dr. Epling, Dale, and Paul and drove to Peck's Butte. The butte is poking from sand deposits, on all sides except the east. On the south east considerable sand has been blown up near the top of the butte.

5:00 PM. *Uma* occurs here but none were seen. We drove over a small butte lying south west of Pecks. There is considerable sand on its south and western faces but no *Uma* were seen.

Chuck and I drove to Llano for gas and then drove to Lovejoy Lake. It is a nice pond about 15 acres in extent damned at its NW end by a cement dam [drawing].

Lovejoy Lake, Los Angeles Co., California

6:30 PM. Large cottonwoods rim the lake. *Bufo boreas halophilis* and *Hyla regilla* are very common. Approximately 70 *Bufo* were marked and released. They were introduced and no natural predators are present (*Thamnophis*), which must account for their great numbers. Some *Hyla* were huge.

Chuck and I took a swim. The water is quite cold. The Becks were not at home.

April 21, 1949

Awoke and drove to Pecks Butte—no *Uma* were seen. None were seen at Wilsona. Only 2 or 3 *Cnemidophorus* were seen. We drove to Victorville and up the Harper Lake Road. We drove across Harpers Lake to some sand blown against an old lava flow. *Uma* was found. They were sitting under small *Franseria* bushes controlling temperature.

Harpers Dry Lake, San Bernardino Co., California

4:00 PM. 5 animals were caught. On the way back across the lake I remarked to Chuck—"There is nothing I fear in driving a jeep but mud." Just then we began to bog down. I stopped and tried to back up—no luck. Some hardware cloth strips from my trap laid in the ruts got us right out.

Breathing a sigh of relief I drove toward the edge of the lake where the bushes grew up so as to get off the lake surface. I drove toward a salt-covered space and just as I tried to get the jeep up over the rise onto the hard bank she bogged down. We had our front wheels about 2 inches from hard soil, but the car was in saturated mud that quivered like jelly. In no time we were resting on both wheel housings.

7:00 PM. We walked 1/3 mile to an old fence from which we ripped 8 2x4s in 2 trips. Darkness set in and the Coleman wouldn't work. There were only low (6 in.) bushes for about 1 mile. The mud was so sticky that we could dig better by hand than by shovel. After innumerable jackups of wheels and frame we finally put 2 2x4s under each hind wheel. I pushed and out she came. Both of us were exhausted from our 7 hours work in the dark. That towards the last (Soledad) we were driving 20 miles/hr. to keep from running off the road.

At Boron we stopped for coffee and phoned home. The waitress was flabbergasted as we were unshaven and covered from head to toe with Harpers Lake mud. Reached home at 4:30 AM and went to sleep on the living room floor.

Harpers Dry Lake—6-7 miles across the dry lake lying in shallow basin draining south east to Mojave. River at Hinkley. Some cottonwoods and other trees all SE corner. Wind has blown sand NE against a lava flow about 300-400 ft. high. *Uma* occurs with *Callisaurus* on this limited sand area of about 4-5 miles in extent around the base and on the sides of the flow. Lava boulders poke through sand here and there. A circlet of hummocks of sand lie about 1/4-1/2 mile below base of lava ridge. They conform approximately with elevation of SE saddle.

May, 1949

West Fork of Mojave River, San Bernardino Co., California

10:30 AM. Left Van Nuys, speedometer 11272.7. End 12189.6 (917 miles).

Drove out to Solemint Store (got white gas at the station there). The weather was quite cloudy but fairly warm.

11:30 AM. 2 miles west of Ravenna I seined the Santa Clara River and caught about 100 fish in 2 tries. Working a 10-foot seine single handed isn't easy but results of this sort are gratifying. About this time I began thinking of Ichthyology as a career. The fish are suckers of some sort I think as their mouth is directed downwards and consists of a sucker like affair.

Mileage from Solemint Store to Acton Junction by way of Mint Canyon 19.2 miles, by way of Soledad 19.8 miles.

I drove out to the small butte west of Lovejoy Butte where considerable sand has blown up against the south face of this granite mountain.

12:00 Noon. The stream bed draining the Picks Butte-Lovejoy regions goes to the west of Lovejoy—swings east along the south face of Lovejoy Butte [drawing].

The sand in the stream is white while that on the buttes is pinkish. Could the Butte sand be a degradation product of the feldspar in the granite without the aid of water sorting?

Callisaurus and *Uta* were the only lizards seen on the butte.

3:00 PM. The north side of Peck's Butte produced nothing. I started to hike up the SE face of this butte but was stopped by the owner of the Golden Mesa Guest Ranch. He was all set for a beef but I didn't give him the chance. I think he was upset because I was so cooperative and polite. He appeared disappointed but introduced me to his wife. I told them what I was doing and all about the animals that live on "their" butte. I am sure he really wanted to boot me out but ended up by being sorry he did.

What I didn't tell them was that as far as I am concerned it is just as much my butte as it is theirs.

I asked him how long he had been there. He said "1 year". Then I told him about the McCalebs who live over on the NW side and about all the other owners and the museum. Maybe he realised he didn't own it any more than I do.

3:45 PM. At Wilsona I hiked over the Butte with no results.

4:00 PM. At Mirage Dry Lake I watched the gliders take off. Two men steady the wings and run along beside while the tow plane picks up speed. They fly quite high before releasing the tow line. They land at 30-40 mph on one nose wheel and skid to a stop on runners that extend clear up to the nose of the ship.

There are some "blow ups" of sand (limited) on the west hills around the lake bed.

5:00 PM. I drove up Horsethief Canyon to West Fork-Crest Line Road junction (Mojave River). A little seining in the strong current netted 3 small fish (*Gila* I think) and water up to my waist. Ichthyology is out—the river is much higher than it was at my last visit and I was constantly picking up boulders and swearing at Boyd Walker for lending me his damned seine.

7:00 PM. Cooked chow and built a small fire. *Bufo californicus*, *Hyla regilla*, and *Hyla arenicolor* could be heard calling.

Bufo californicus has a call much like *punctatus* only softer. This species preferred the edges of the swift cold water and would swim to the bottom when disturbed. In this situation it matches its background perfectly.

Hyla arenicolor liked this same situation. One pair was found in amplexus at WT 15.1 degrees C. Their call is similar to *regilla* except that it is a single note and harsher.

Hyla regilla and *Rana aurora draytonii* preferred the stagnant backwater areas. 1 specimen of *Bufo boreas halophilis* was taken in the stream.

May 8, 1949

Base of Mountains at SE corner of Coyote Dry Lake, San Bernardino Co., California

7:00 AM. Arose and cooked breakfast. Drove along Mojave River. Crossed it to Apple Valley Road, crossed bridge at narrows. Bought gas at Victorville. I seined the narrows and drove past Hodge to the Hinkley Cutoff. Took it and drove past Hinkley to SE corner of Harpers Dry Lake, turned around, drove on a dirt road to sand dunes near Hodge along the river. Drove upstream on riverbed and finally crossed over. I then drove through Barstow, over the Mojave River again and out past Calico Lake, turned south to Daggett, drove up the north stream bank on a dirt road in sand dunes. I returned to Barstow-Baker Road and drove past Yermo to Coyote Well Road. Then I cut off and drove to the lake, cutting across the bed and after 2 attempts I drove up to the sand dunes at the base of the mountains at SE corner of Coyote Lake.

10:30 AM. Mojave River at Victorville: I seined the stream here. It is a cussed job alone. The current is surprisingly swift. *Gambusia* was most common fish. Boyd Walker sinks lower in my estimation each time my seine comes up empty after breaking my back pulling it through the water.

Finally I learned to seine among the reeds and moss at the edge of the creek and at once came up with enough fish to renew my interest in ichthyology. I caught many *Gambusia*, a number of *Gasterosteus*, 1 perch, 3 or 4 *Gila* (?), and about 1 dozen large tadpoles of *Rana catesbiana*. They have a spiracle on one side only. They are not bilaterally symmetrical.

12:00 PM. Hinkley: As far as I can see there is no sand in the near vicinity of Hinkley that might support *Uma*. The animals recorded from Hinkley may have come from Harper Lake or Hodge. I saw 2 *Crotaphytus wislizenii*. Females both were in nuptial color and both were shedding.

The sand deposit at Harper Lake is bigger than I had supposed. It completely encircles the lava flow on the NE corner of the lake, thus there may be 50 acres of sand available to *Uma* there.

12:30 PM. Hodge: There are some good deposits of sand here, maintained by the Mojave River. I saw no animals. They run for about 2 miles and on the north bank get to be ¼ mile wide in places. Some of the most well developed dunes are right on the river bank.

1:30 PM. Daggett: Ate lunch here. I saw my first *Dipsosaurus* of the trip—5 in all—I only got 1. They are very wary. The sand is in a nice long deposit both NW and NE of Daggett on the north bank of the river. The sand is very white and somewhat compact. It is definitely derived from the river as it rests on a reddish volcanic range of hills. The stream beds are pink with the volcanic material.

Daggett: No *Uma* were seen. The wind was quite strong (from upstream) and this may have been the cause.

Calico Dry Lake: Apparently there is no deposit of sand of any consequence from this lake.

3:00 PM. Coyote Lake Road: It is a dirt road that winds over a saddle of volcanic material (also agate like rock is common). I observed territoriality in *Callisaurus*.

A male *Callisaurus* was startled on the road by my car. He ran across a little flat of desert pavement. Another male at once took up the chase and drove the intruder about 50 yards away—up a bank. The aggressor ran with his tail curled and his black bars showing. A female was resting right in the center of this territory. I shot her and she proved to be in full breeding color (gular spot) and full of developed ova.

4:00 PM. Coyote Lake: The road leads along the west slope of the lake. There is no sandy soil here. The east side is very sandy. On the south east corner of the basin is a ridge of mountains with a subsidiary ridge in front. Both have sand filling their canyons over a considerable area. Large patches occur clean to the top of the larger ridge. The rock is brown and the sand is white.

A fork in the road of SW corner of lakebed is reached and at that fork is a 20 in. pipe (tile) with a metal cover which projects about 12 in. out of the ground. It is a well and water can be seen at about 20 ft. The water was good (I dipped a can into it on a cord.)

5:00 PM. I crossed the lake (not wet thank god) and drove up one road leading to a mine on the north west end of the sandy mountains. No sand here of any consequence.

5:15 PM. I came upon a *Chionactis* lying in the sun (see species acct.). He was lying, stretched out, on the south side of a small hummock. The snake, thus, was not receiving all of the effect of the sun, but nonetheless—he was out! Sunset was at 6:30 PM.

6:00 PM. An *Uma* was definitely identified. I made a grab for him and missed and the rest of the story is as sad as this—he ran down a burrow. Camped at the base of the larger ridge with a good *Larrea* fire and some corned beef hash.

It has been very windy, fairly warm, and clear today. Collecting has been punk[?].

May 9, 1949

Newberry Road, near Yermo, San Bernardino Co., California

Itinerary. I have gone an amazingly short distance today.

6:00 AM. Arose, not of my own volition but of the sun's. I drove around these dunes for a considerable time and then picked my way down the alluvial fan to the "East road to Coyote Lake." I then returned to the Barstow-Baker Highway, crossing a small playa on the way. I then crossed the railway at Harvard and cut down into the Mojave River Bottom. There are some nice farms here and a little running water teeming with *Hyla regilla*. Crossing over, I followed the south bank eastward toward the Cody Mts. There is a small "blow up" of sand from the river here. I hiked up a wash and returned to the car. After driving a short distance west from the slope, I stopped and ate lunch next to a low circular tank (31/2 ft. high.)

There are 2 or 3 fish in this tank. The water is very good. It belongs to the Cady Ranch. Next I drove south to Troy Dry Lake and then up to the sandy ridge to the east of the lake. After some hiking I returned to the lake again and out a new dirt road to the south west leading to a railroad siding. I found that it leads to a silica mine where sand-blasting material for the navy is mined. Their road is very dusty and very windy. The pickup top was bent and 2 of the stays (metal) were snapped by the wind. I took the top down at Newberry. I am now on the Newberry-Harvard Rd. waiting for darkness.

Alvord Mts. *Uma* was found here and seems fairly common. I shot a *Cnemidophorus t. tessellatus* and didn't kill him at once. I sw a piece of his tail wriggling on a low twig of the bush (*Dalea*). When I retrieved the whiptail I was surprised to see that a little investigation revealed *Urosaurus graciosus* hanging head-down in the bush. He was untouched except for his broken tail. What a way to discover this animal so far north of his known range!

I caught another specimen after shooting a *Callisaurus* which ran into a *Dalea* bush. In the bush was *Urosaurus*. I never did find the *Callisaurus*.

Cady Mts. extend from the Mojave River on the north to the SE corner of Troy Dry Lake. On the north end some sand has blown into canyons and up on the face of peaks. It was derived from the Mojave River.

A hike up a canyon netted no *Uma* though it is reasonably certain that one was seen. The area habitable for *Uma* is very small here (5 acres).

Cnemidophorus were seen twice following each other "indian fashion"—the larger individual behind.

Blow ups on the south end of the Cady Mts. are considerable and have been derived from Troy Lake. This deposit is one of the coarsest ones seen. On the slope directly exposed to Troy Lake I do not think *Uma* will occur. The sand is compact and blown into windrows that made the car bounce like on a washboard.

Cady Mts., San Bernardino Co., California

Behind this ridge when the force of the wind is lessened the sand is finer but is still quite coarse. I think I saw 2 *Uma* but neither identification was positive. The tracks look like those of *Uma*.

I drove till 9:00 PM and picked up 2 geckos and a *Chionactis*.

The car is parked in a wash near Afton Canyon. Water must be close as palo verdes(?), *Chilopsis*, and mesquite are thick.

With my notes out of the way and no one to talk to I feel that I should write something—preferably something sage with the smell of the desert about it—old prospector stuff. After my experiences with a 10 ft. seine alone I could write something acid about that—but that is far removed from the desert.

Afton Canyon, San Bernardino Co., California

The Coleman appliances have been, as usual, putting me through my paces. A change has been wrought, though. It might make happy prose to tell how I mastered the lantern. One night, at a very critical time (while Chuck Lowe and I were stuck in the jeep up to both wheel housings, in Harpers “Dry” Lake) it refused to work and we were forced to slave for 7 hours in the darkness. Twice on this trip it has failed me—but I’m on to its tricks now (maybe). Right now it is grumbling and groaning but giving off light. This is only because I cleaned its generator out with a needle. The stove is still another story which I am not going to tell.

How about talking about camp fires? Every outdoorsman writes about campfires.

May 10, 1949

Cronise Dry Lake, San Bernardino Co., California

There is considerable sand in this area [drawing]. Sand has blown over the ridge and has formed an area of limited sand in Afton Canyon.

Along the west edge of the playa just north of the blow up called the “Cronise Cat” is another blow up. At the base of this sand is an old beach—probably reworked with numerous shells imbedded in it. There are 3 species. (They look like fresh water forms.) The sand itself contains quite a few fragments of shells. Afton Canyon supports a few fresh water snails and is only about 5 miles away.

Silver Lake, San Bernardino Co., California

[drawing] 2:30 PM. A large male *Callisaurus* was shot on a rock protruding up from the lake bed proper. He was wounded so that he could not run away but instead gave me a threat display. His dewlap is amazing [drawing].

He tilted up on one side and presented all his bright colors to me. He could be frightening to another *Callisaurus*.

The *Uma* here occur on a very restricted habitat. They are beautiful animals having red color on eyelids and along lateral fringe from axilla to groin and along middle

portion of tail (on its edge). Medial to pink color on lateral fringe is the yellow green typical of *scoparius*—this is on hind legs and tail also. This color is on ventral surface of tail. A *Callisaurus* was caught (female) with an orange red gular patch, the same colors in axillae, bright yellow along lateral edge of abdomen and prox. portion of tail. She had developed eggs.

Uma for the first time was seen to climb rocks and go in crevasses. The habitat is so limited (1 acre) that they may be forced to occupy marginal habitats.

Over the hill from Silver Lake (to the west)

Large male *Uma* taken that does not show the red color.

3:30PM. There is an area of perhaps 20 acres of poor sand and brush here. A very small playa (1/2 acre) is present. A powerline road and the road to Gailie Springs pass through this valley. It drains to the north in Silurian Lake.

May 10, 1940

Saratoga Springs, Inyo Co., California

Itinerary:

6:30 AM. Arose and ate breakfast. Drove to Afton Canyon. The road to this canyon is as follows—pass Cronise Station going east, cross the bidge over wash that drains the lake—on the east side, up against a hill is a dirt road going south. Keep right for 2 turns and keep to the left of a black hill with several mines in it. This hill is about 3 or 4 miles from Highway. Drive up small canyon and over the top by making left turn just before summit is reached. (I think left and right are reversed in these directions—K.N.) You then drop down on a road built over a narrow gauge railway (dirt filled in between the tracks). Cross the Mojave River east of railway bridge and turn right before you go up on a fill. You pass around an old shack and then up the canyon.

I drove out of Afton Canyon—a very beautiful canyon of precipitous walls of fluted sandstones of reds, grays, and browns. The Mojave had risen to the surface here as a small stream full of mosquito fish (*Gambusia*). Mesquite and *Tamarix* are common.

Then I proceeded to Cronise Lakes where many specimens were secured, including a new locality for *Uma*. I then drove on to Baker. On the way I saw a raven eating a *Callisaurus* (probably a DOR) and what looked like *Dipodomys deserti* sitting up in a bush! I then drove up to Silver Lake and then over the hill on a very dubious road and then out on Powerline Road to Shoshone Hwy.

At Salt Springs I cut in to the Sperry Canyon (Ibex Pass) Dunes. There is no road and the going is very rough. I advise getting to these dunes by going up Sperry.

I obtained a *Urosaurus graciosus* here and a couple of *Uma*. I think this sand [labeled 1 in drawing following] is a composite of sand from Silurian Lake and from the Amargosa River—probably mostly the latter. The sand at 2 [in drawing] is probably mostly from the lake.

A similar deposit (smaller) occurs just south of Saratoga Springs (along the Amargosa River).

At the springs I met 2 men—one middle aged and the other 89 years old. They are both here for the health giving properties of the spring water. They are staying in the little rock shack. The old man has put in a screen porch (to keep out mosquitos). I wish I had one as there are lots of the beastly creatures.

The old fellow was a prospector of sorts in this area for 25 years or so on and off. He says an old Dutchman established Cave Springs. A man named Runey (Jack) who works in some capacity for the state in connection with mapping built the shack at Saratoga Springs. A two story store and house once stood here. He also built a bath house and a small house for bottling the water. Apparently the Government stopped this latter endeavor.

I took a very fine swim in the pond and got cleaned up a good deal—now I am going to take another one just for the enjoyment. The water is 72 degrees F.

May 11, 1949 and, 3 miles N. of Saratoga Springs, Inyo Co., California

It is apparently produced by the Amargosa River [drawing].

2 miles S. of Saratoga Springs, Inyo Co., California

This sand has been accumulated by Amargosa River. There are peaks 150 ft. high of pure sand [drawing].

Kelso, San Bernardino Co., California

7:45 AM. I arose after a nearly sleepless night (due to mosquitoes). I devised all sorts of clever systems (none of which worked) to ward off the beasts. I made a mosquito bar out of the seine—this kept them out but I could not move or I would upset it. Finally I went up on top of the hill where there was a good breeze. This kept them away for a while but the wind died down so I got up.

I drove up the So. Cal. Mineral Company road (a talc outfit) to the sand 3 miles north of the spring. I saw no *Uma*. They are probably there however. I was very sleepy and not very diligent.

Back at the spring I said goodbye to the old man (Fen Winans) and to Frank Barman (?). I then drove up another mine road from the springs that circles south around the mountains to the deposit of sand there.

I took *Uma*, 2 of which showed the lateral red color I had seen in the Silver Lake population. I clocked an *Uma* (male adult) at 15 mph. He was running full speed over open sand.

Then I drove to the Sperry Canyon Dunes. I took several *Uma* and other beasts.

Down in the canyon I seined out 2 species of fish, a pale *Cyprinodon* and a little silvery fish (*Rhyniethys*?). I ate lunch here and then drove on into Baker. I was mighty sleepy and had to stop for a snooze.

At Baker I began the “much fabled” Kelso-Baker Road. I had been told it was solid sand and had big washouts 10 ft. deep, etc. etc. It leaves from the west side of the station. For the first 10 miles it is a fine road. About here I cut off to the west to a black volcanic peak north of Old Dad Peak/Devil’s Playground.

Before I turned I told myself I would go over and get a new locality record if I found a road. I found the road and *Uma*. The main road became quite sandy and I picked up *Uma* (in a wash where sand has been blown up) about 3 miles beyond the cut off I had taken to Old Dad Peak.

The road then becomes rough because it crosses an alluvial fan at right angles. None were impassable however. A few miles further I came to a powerline road—one way lead to Sands and the other to Kelso.

Sands must harbor *Uma*. It is a large area of black hills with long ridges of sand leading up to them. The flat places support real barchanes.

I went toward Kelso. The last Kelso sign I saw read 16 miles. Apparently I went wrong as I followed the powerline road for miles and finally cut down a road along a phone line that brought me out east of Kelso. Indigo bush, mallow, penstemon, and lupine were in bloom on the ridge north of Kelso. I have camped in some sort of excavation pit.

A while ago I heard a weird noise. It sounded like something big was choking or rabid. Then I saw the white muzzle and belly of a burro. I guess I never heard one “hee haw” before. To the sack.

May 12, 1949

Kelso Dunes

7:00 AM. Arose and drove to Kelso. I dropped in the general store to buy some milk. A real “farmer type” was reading the paper with comments—with regard to workers who had dug a little girl out of a 90 ft. water pipe. He said donations totalling \$40,000 have come in for the 4 men who dug the hole. Someone had suggested that the money go to establish a scholarship to Claremont College.

The farmer (whose face was twisted off to one side) said “Why that god damned _____. What the hell does he think he’s trying to do? Send some rich man’s son to college to learn to be a goddamned astronomer or something?” Then he shot a bolt of tobacco juice into a No. 10 can (this explained his twisted face) and turned to a new tack—“I ain’t see a no husband killins for a month. Some old lady was always knocking her husband off a fire plug. I reckon the city ain’t what it used to be.”

I drove out to the dunes but had little luck as it was already so hot (8:30 AM) that most animals were controlling their temperature. A good road goes just south of the dunes. To get to it you cut across the tracks just west of town and turn up the paved mine road (a Kaiser Mine) till you come to the phone line—turn right out the road along the line. After a couple of miles it makes a bend and then goes straight over the saddle between the Providence and the Granite Mts. About ½ mile south of the bend is a “good” (2 rut) dirt road cutting off to the right—take it and you will skirt the south face of the sand mountains.

May 23, 1949

McCoy Mts., Riverside Co., California

Dad & I left Van Nuys. Speedometer reading 12382.9. Drove through deserted streets and had breakfast at Azusa. We drove to Beaumont and Banning. Next canyon west of Snow Creek I made a short reconnaissance of some sand that has blown up on the west slope of a spur in a semi-circle on the south bank of San Gorgonio Creek. *Callisaurus* & *Cnemidophorus* were taken and *Uma* was seen. This extends *Uma*’s range upstream.

Drove through Palm Springs to 1,000 Palms.

10:20 AM. We caught *Uma* and *Dipsosaurus*. *Dipso* was controlling temp for first time I have seen it this year. One *Dipso* was seen in Chino Canyon perched on a

huge boulder. The females are definitely under cover. The *Uma inornata* show a slight spot on the lateral fold.

10:40 AM. Had lunch at Indio and drove to All American Canal on Aqueduct Rd. There I saw *Uma* probably. I caught 2 *Dipsosaurus* controlling temperature.

1:30 PM. Drove to Desert Center. Then we cut down a road 10 miles past Desert Center to a shack and corral at the edge of Palm Dry Lake. There we met a gentleman with a large cud of tobacco in his cheek. He apparently had some stock—dogs, sheep, cattle, and plugs (as he put it). He well was 150 ft. deep but drawing “good” water from 90 ft. Desert Center gets their drinking water at a well north of town. The wells in “town” were salty. We drove past his house and over a nearly absent road to the playa (last rain in 1939). The playa is very soft and sandy.

At the SE corner of Pinto Basin there is a low group of rocky hills. These hills are covered with sand blow-ups of some extent [drawing].

Sand surrounds the south side of Palm Dry Lake in a semi circle, there being two concentrations of well developed dunes. These are on the SE and SW corner of the lake. The SW concentration is the largest and is constituted of barchanes and nondescript dunes of very fine sand resting on a hardpan base. 3 *Uma* were seen for sure [drawing]. None were taken as the animals were extremely wary (very hot) and there was lots of cover.

3:00 PM. We left Palm Lake and drove about 10 miles to the Hopkins Well Road (which proved to be to the south of center of Ford Lake rather than on its western edge as the Auto Club Map said). This road apparently leads to the west base of the Palm Mts. (good road). Hopkins tank and well are abandoned. We retreated and returned to the road. About 3 or 4 mile further east I saw an area of about 50 acres of low dunes at the SE corner of Ford Lake. *Uma* was taken here.

5:00 PM. Left Ford Lake and drove east of McCoy Springs Road which we followed northward. It is a very devious but good desert road. We did not find the springs because we were hungry, tired, and General Patton had left so many roads we didn't have a chance. We camped in a wash. Pa cooked ham and potatoes and coffee over some palo verde and mesquite branches. Dinner was delicious (thank you Theodore Roosevelt). The bacon was literally wringing with grease—our butter was liquid and the jar top was loose. It leaked out—it may not butter our bread but it did lubricate the rear springs. I called up a screech owl. I also heard a poor will and saw a great horned owl. To the sack.

May 24, 1949

3 miles S. of Sonoita, Sonora, Mexico

5:30 AM. Arose and cooked breakfast. We drove back to Blythe Highway. Enroute it was noted that Ford Dry Lake has a considerable area of hummock sand at its south east end in addition to the small dunes mentioned yesterday. Drove to Blythe and out on the scarp to the west of town. I took a considerable hike over an area of very excellent *Uma* habitat. I saw 1 *Uma*.

I shot a female leopard lizard in the most brilliant post nuptial coloring I have ever seen. This coloring must serve different purposes in different lizards. Probably in the leopard lizard and *Callisaurus* it might serve to frighten away males. Male and

female *Uma* (the female in brilliant color) were seen together at Ford Lake. The function here is not at all clear.

We drove to Quartzite and down to near Yuma where we cut over to the highway at Ligturta. About 6 or 7 miles up this road from the highway some blown sand is located. It apparently has come from a stream bed nearby. The day was exceptionally hot (108-109 degrees F.). We drank water, beer, water, orange ade, water, ice cream, water, coke, and water.

The country is most uninteresting and barren till Gila Bend is reached. The road south to Ajo is quite vegetated with mesquite, palo verde, and cacti. We did night drawing[?] till camp was reached. 2 *Hypsiglena* and 1 *Phyllorhynchus decurtatus* were taken. A *Bufo punctatus* was taken at Sonoita checking station. The stream houses a very loud chorus of these animals. Bugs are everywhere and I can hear cows mooing. Pa is objecting to the bugs so I must stop.

May 25, 1949

48 miles SW of Sonoita

Good sand—*Uma* seen. Rolling sandy plain. Sample taken. This sand extends for 7 miles, nearly to Punta Penasco.

Cholla Bay, 6 3/4 miles NW of Punta Penasco, Sonora, Mexico

Left camp 3 miles south of Sonoita. Our camp was located among a lot of saguaro cacti and ironwoods, palo verdes, and mesquites. Many of the palo verdes are in bloom. White-winged doves cooed at each other in contest fashion from the tops of these cacti.

7:00 AM. We drove toward Punta Penasco through a series of rocky mountains on which grew dense forests of the vegetation we had seen at camp. Organ pipe cacti became common. Shortly we began to lose altitude and all the cacti disappeared giving way to *Larrea* scrub. This scrub clothed a more open plain.

At El Papolote we stopped to investigate a sandy area. *Uma notata cowlesi* is common. They were not very wary.

At Punta Penasco (about 3 miles west of the end of the dunes) an area of stark white sand dotted with low scrub occupies the edge of the bay to the north of the town (1/2 mile long).

Punta Penasco is a busy little place of possibly 2,000 people. The town is built on a rocky hill (Rocky Point) that juts out into the sea. It has felt the American influence as some signs are in English and most persons speak a little English also. A railroad (Ferro Carril) with a very small, though modern engine comes into town.

The graveyard is typical of all Mexican graveyards, being full of paper wreaths and gaudy tombstones. It is perched precariously on the side of Rocky Point.

At El Papelote we were converged upon by 3 ninos of about 10 years. Pop gave them some candy. They looked very pleased. I had a great time exercising my spanish on them. They asked as if we were going to eat the umas. They were also convinced that my *Hypsiglena* was a "vibora". I showed them that it had no "cascabel" on its tail. They conceded that it was just a "culebra pequena".

We left P. Penasco and drove to Cholla Bay. The road goes along the east side of the railroad for a while and then cuts over the tracks and winds to the Bay.

A Mexican named Nacho runs a fishing camp at the bay. When we arrived he had a 12 change record player going in his 9x12 store (abarrotes y cerveza). It was so loud that I had to yell to him to get 2 beers. The little shack fairly pulsated with spanish quartet music. It is a series of choppy words said in harmony and then a word such as “corazon” strung out and sung on a decreasing pitch—then more choppy words. I can hear the music now.

We fished and I swam, seined, and hiked.

May 26[?], 1949

Mileage 13044.7, 661.2 miles from Los Angeles.

I saw 3 great horned owls up in a small rocky hill that lies on the south west corner of Cholla Bay. The bay was a crescentic bay about 1 mile across when we arrived. By 4:30 it was completely empty. Mud flats run out about ½ mile. The tide must exceed 15 ft. in range.

A large range of peach-colored sand mountains can be seen to the north of Cholla Bay. They reach the sea's edge about 5 or 6 miles up the coast from Cholla Bay. They run southeast from there. I have no idea of their extent to the north. They appear to be 100 ft. high or so. I suspect the sand at El Papalote is the southern remnant of this range. Both Pop and I are tired. I am quite sunburned. I suspect we will not stick around here three days as the heat is quite uncomfortable and we only have a tarp for shade.

It is now about 9:00 PM and the tide is not yet in. I think I will hit the sack.

May 27, 1949

34 miles SW of Sonoita, Sonora, Mexico

There appears to be a stretch of peach-colored sand going along the base of a small range of mountains. It appears to cover a series of low hills NW of this range. On its eastern end it is blown up on what might be a volcanic peak.

1:20 PM. Sonoita River—seined a series of *Cyprinodon*. Water temp 34.3, 6 in. to 2 ft. deep. Filamentous green algae. Water clear, 2 mph current and still pools 7-10 ft. wide.

Quitobaquito, Organ Pipe Cactus National Monument, Pima Co., Arizona

[?]:30 AM. Arose and started to eat breakfast when a spanish gentleman came walking down the beach. He began talking (in spanish) about a “liebre” he had seen. We talked for about an hour. I was constantly looking up words. He told me about Apache pictographs on a “cerro” near Hermosillo showing the moon, arrows (fletcha). He said snakes (vibora y culebra) come out about May at Hermosillo. He also said there are all kinds of salamanders in the area. He was much impressed with our cots. They would cost 35 pesos in Hermosillo and still rip to pieces as soon as you used them, he said. The truck, I told him, belonged mostly to the finance company (hacienda publica). He didn't seem amused about this. What probably impressed him most was the fact that we buried all our rubbish. He said he was a good friend of Nacho's. He asked if we were “amigos o padre y hijo”—apparently you can't be both. He said to be sure and visit him when we come to Hermosillo. He seems to be chief clerk there. His address is Ramon E. Corral, Jefe Archivo Gral. Gobierno de Estado, Palacio Gobierno or Ramon E. Corral, Calle Morelia No. 18 Pte., Hermosillo, Sonora.

I gave him my address with similar instructions.

7:00 AM. We left and drove to Punta Penasco. There I made a trip over the white sands back of the bay. I saw a lizard thrashing in a bush so I shot at it. It ran off but I found I had hit a red racer (that had captured the lizard). I caught *Uma* here. We drove to El Papolote and I shot 9 *Uma* here. The little ninos reappeared bearing a dead *Uma* on a string. Pa gave them 2 sacks of candy and some water, both of which they accepted with wide grins. I still wonder how they caught the *Uma*.

We drove up the road to the Sonoita River where I seined a series of *Cyprinodon* for Boyd Walker. We then crossed the border and had our Los Angeles potatoes taken away. The guards were interested in my snake (except 1 guard). This latter fellow seemed very much impressed with his own importance and glad to take our potatoes away. He tried to make us feel like criminals who were smuggling potatoes. About this, we didn't feel guilty. If there was any such feeling it was about the gun hidden under the seat.

One of the guard's friends told of running over a 4 ft. snake about as thick as a lead pencil. He said it was quite pale. Also it disappeared before he returned. This location was about 3 miles north of Sonoita. He was the sort who is full of hot air but nevertheless the description fits *Oxybelis* and I doubt that he would have heard of the snake.

We drove to Quitobaquito (15.2 miles west of the Ajo road). You take the road just north of the border marked "10 mile scenic loop". A short distance west the loop goes north. Go straight ahead at this junction. Later on another crossroads is reached. Take the one marked "Patrol Road". Quitobaquito is a good spring of clear water running into a shallow pond surrounded by rushes and mesquite and cottonwood. Some willows occupy the south end.

We saw Mexican ground doves, white-winged doves, mourning doves, cowbirds, vermillion flycatchers (a beautiful beast), English sparrows, nighthawks, verdins, turkey vultures, killdeer, and Gambel's quail. The border patrol has a station here. We talked to Mr. Cleveland and wife who rides the fence. He was at Triajas Altas last year.

Back at Monument headquarters we talked to a Mr. Bean (ranger) and W. Max Hensley of Univ. Illinois who is working for his Ph.D. on a population study of birds in the monument. He is working under S. Charles Kendrigh of Univ. Illinois. He had collected a lot of snakes including *Trimorphodon*. We drove the road getting 1 *Chionactis* and a gecko. We camped near Ajo.

May 28, 1949

West side of Mohawk Mts., Yuma Co., Arizona

11:30 AM. Peach-colored sand deposit. The sand is not very extensive.

Mouth of Pushawalla Canyon, Riverside Co., California

6:30 AM. Left camp south of Ajo and drove to Gila Bend where we had breakfast and picked up ice in our precious water jug. Pa got his hair cut and nearly ruined the barber's clippers with the sand and gravel trapped in it. We drove on to 6 miles east of Yuma where some small sand dunes are located. They are concentrated along a river bank but I think derived from across the Colorado and not from the wash.

No *Uma* were seen and I do not think they occur here. *Dipsosaurus* was seen. It was very hot and clear.

11:30 AM. We ate lunch in a lousy café served by 2 platinum blond (H202) painted waitresses. We then crossed the Colorado and drove up to Laguna Dam. Just over the sluice gate there is a sand spit extending northward back up the lake about 250 yards from the dam. There is a row of palms and a good many cottonwoods on the land. It is quite rocky. Who should we meet sitting in the shade drinking from a canteen but Joseph Slevin of California Academy of Sciences. With him was Wallace Wood. They had just returned from the Huachucas Mts. They didn't find *Bipes*. [Drawing]

We went out on the spit and by turning over rocks shaded by dense willows we got 4 *Leptolyphlops* and 3 *Sonora miniata linearis*. It was very hot and humid. The snakes were found in somewhat moist soil. J. Slevin was on his way to El Doctor on the head of the Gulf of Calif.

We left the Yuma valley and drove to the All American Canal at the Sandy Hills. Here I observed *Uma*. They show the red ventral coloration. It seems to be definitely not post nuptial with this form. We then drove to Holtville and had dinner at a nice café. The waitress sneered at me (I hadn't shaved for 5 days). She served us however. Then we drove through Nilaud and Mecca, picking up several snakes on the way. Geckos were quite common.

We drove through Indio and up the Powerline Rd. to Pushawalla Canyon. I could not find the road in and we were both very tired and sleepy so we camped on the alluvial fan. The wind was blowing down the fan about 20 mph in gusts. Under these uncomfortable circumstances we hit the sacks.

The day had been clear and warm. The only wind we encountered was at Coachella Valley.

May 29, 1949

Van Nuys, California

5:30 PM. We arose and drove to Garnet, had breakfast, and drove home. The wind was near 30 mph in San Geronio Pass. A thin drizzle hovered over us from Beaumont to Glendale.

11:30 AM. Arrived home. I have been looking at *Leptolyphlops*. They would make a fine experimental animal for temperatures as they are translucent. Peristalsis and heart beat could be directly observed by shining a light through them. Different environmental conditions could give some interesting answers.

July 30, 1949

6.5 miles N. of Old Bingham, Socorro Co., New Mexico

After much packing and waiting around, Chuck Lowe and I, driving a 4xWD weapons carrier and Dave Dunn and Sid Gordon in another similar vehicle left Socorro. We drove south of town to San Antonio, crossed the Rio Grande and proceeded towards Bingham on the Carizzo Road. The weather was clear and warm with thunderheads forming in the afternoon.

We left the highway at Bingham, driving to Old Bingham and then towards the Wry Ranch over rolling juniper-dotted plains. We ate lunch at the Wry ranch (an "Alamo")

type adobe and a wooden shack). A rain (very recent) had filled a catch basin with opaque red water.

12:30 PM. Several pairs of *Scaphiopus hammondi* were seen in amplexus, floating in the center of the pond. The females were often completely submerged and out of sight. The males were clasping with their front legs only.

We drove on and made camp alongside a large juniper. Tarps were strung as a thunderhead began to spatter us with rain. Later we set out traps (135) for wood rats. Later I cooked a cake (successful). We discussed this and that and ate the cake.

July 31, 1949

Same camp. Shot a porcupine and cooked him. He was very tough and we are parboiling him. Dissected rats and set out traps.

August 1, 1949

Kept cooking the porcupine. He still repels our gastronomic advances. Trapped and dissected more rats. This is a tedious process (1½ hours per rat) and I do not especially care for it.

August 2, 1949

Same camp. Made chili con carne out of parts of the porcupine. Dissected more rats. Trapping was poor (5 rats for 135 traps plus several *Peromyscus* and *Perognathus*). We drove up to Chupadera Mesa about Cok—[?] Ranch and met a crew of visiting dignitaries including Dr. Bellamy of UCLA, Dr. Peirson, incipient assistant director of Medical Biology of Atomic Energy Commission, and Dr. Jenson, the present Assistant Director under Dr. Shields Warren.

Dr. Jenson was quite sympathetic with our ideas concerning population structures and reinvasion at the crater. This support was pleasing when from so high a official of the Commission. The Dr. is a remarkable person, most incisive and logical. He has one of the best commands of the scientific method I have yet seen.

We left and drove into Socorro.

August 3, 1949

Socorro

Packing for our trip north.

August 4, 1949

Sandia Peak, Bernalillo[?] Co., New Mexico

We left Socorro about 11:00 AM and drove northward. Chuck Lowe and Dave Dunn in 1 weapons carrier and Sid Gordon and I in the other. After a flat tire at Jarales we proceeded to Albuquerque while Chuck and Dave went to Mountain Air.

While our tire was being fixed Sid and I shopped for a few items. Then we drove up a long alluvial fan to the base of Sandia scarp. These mountains have a gentle east slope and drop off precipitously on the west. The mountains reach approximately 9,000 feet and are forest covered in their higher reaches by yellow pines and white firs. Lower down the forest changes to pinon-juniper.

We drove up the Sandia loop road and camped at about 7,500 ft. under oaks and yellow pines alongside a small grassy meadow.

After a while the wet wood finally gave us a fine blaze. We had T bone steaks, fresh fried potatoes, mushrooms, peas, and a chocolate cake. Later we worked on plants and lizards and hit the sack at 11:20 PM under a clear moonlit sky.

August 5, 1949

Santa Fe Airport, Santa Fe Co., New Mexico

I awoke about 8:15 and took a short hike. When I returned Sid was still asleep. He got up just before 9 and we collected a large series of plants from the meadow. Pressing is a long tedious job and took till 2PM. We then drove up the road toward Sandia Crest (10,678 ft. elev.) We collected many more plants on the summit. The diversity was great. We took mariposa lilies, Indian paint brush, larkspur, columbine, buttercups, and many less spectacular plants.

On the way down we stopped to press plants. This we did until dark without getting done. Then followed a long cold ride in the open weapons carrier to Santa Fe. We had planned to stop at a motel but they were all filled. We drove around town looking and finally got lost. Finally we found our way after driving through several backyards and drove out to the airport.

At 11:30 PM we camped, tying our tarp to a farmer's fence with lightning storms on all sides of us. We immediately hit the sack and I slept through our only shower.

August 6, 1949

Truchas Peak, Santa Fe Co., New Mexico

We pressed the remainder of our plants and proceeded into Santa Fe for breakfast. Then we drove north toward Taos, cutting off on a backroad to Truchas. Truchas is a lumber town set on a pinon-juniper covered bluff bordered by stands of yellow pines. The streets are dirt and since it was raining they had turned to a sticky red mud. We bought a pie and 2 quarts of milk at Martinez General Store. This is a fine store and carries everything from pabulum to garbage cans to peevies. We left and drove up a road (called one out of politeness) which was really a sea of mud, past farms set in a long meadow between forests of yellow pine. We met 2 log wagons which were pulled by horses. At this rate logging will make no real inroads into the forest.

Presently we cut into the forest, passing through park like meadows and dense stands—always following a little mountain stream.

As we gained altitude white fir became dominant and aspen became quite common. Some of these aspens grew in groves so dense that each tree was forced to vie with its neighbors for sunlight. Thus the trees were 80-90 ft. tall and straight and limbless for 60 ft. or so.

After crossing several doubtful log bridges we came to a grassy hill on which were 4 log buildings. We camped here and set up our equipment in a mud and aspen log building about 15 ft. square. 5 large pine beams support a sod roof about 1½ ft. thick. We took several species of plants from the dense growth on the roof.

To the northeast we can see the boulder fields of Truchas Peak above the timberline. The stream forks on either side of one hill, flowing through grassy meadows. The elevation here is 9,750 ft.

The altitude is affecting me and I have lost much of my energy. Sid is just recovering from an attack of indigestion. In spite of this I cooked up creamed tuna and rice, hot corn bread, and coffee.

The wood stove in our cabin has warmed us and we are both ready for the sack.

August 7, 1949

Rio Hondo, near Taos, Taos Co., New Mexico

I woke up about 7 and got up. Sid was still sleeping. I went down to the creek and washed myself. All traces of the altitude sickness of yesterday were gone. I found a trail that looked like our best bet for Truchas Peak. All the birds and beasts were out in their usual morning numbers. Both a chipmunk and a golden mantled ground squirrel were on the meadow cavorting around. Also a tree squirrel, dark gray in color with slight ear-tufts was seen. I could hear them cussing at one another as they leapt from branch to branch.

Finally Sid arose, we ate breakfast (his indigestion was gone) and left for the peak. Thunderheads were scattered over the sky occasionally rumbling at us. I carried a pack sack containing lunch, my camera, and a pistol, and equipment for our radiological samples. Sid carried binoculars and a vasculum.

We hiked up a well marked trail through dense fir and aspen stands. We were well over 10,000 ft. when the trail ended in an area of felled trees. After considerable reconnoitering we located an old logging road where it crossed a water-filled meadow and followed it up onto a ridge. It gave away to a good trail which rose rapidly through the forest.

Once I stopped to look at a tomato-red fungus about the size of a softball. Among the red areas was a reticulum of orange. This forest is full of fungi of all sorts, many very large.

The trail entered a pine stand of tall aspen at about 10,000 ft. It was like walking into a greenhouse. The light was filtered by the leaves giving everything a green look. In addition the forest floor was covered with all sorts of moist-lush plants. Pinky logs covered with many kinds of mosses and lichens lay here and there.

As we continued to climb the trees grew smaller and more contorted. In some places many of the aspens were bent to the ground by winter snows. The clouds now covered the sky and thunder could be heard nearly constantly. Finally we dropped down into a beautiful meadow, hanging on the side of Truchas Peak. The altimeter stood at 10,700 ft. This meadow, about 100 acres in extent, was the source of one of the streams that flow from the mountains. Among the fields of skunk cabbage, ice cold water flowed from the black soil. In this icy water were matings of a small white *Ranunculus*. Here and there in the meadow were islands of firs and aspens. To the north we could see the barren rocky and sparse, snow-clad slopes of the peak itself.

The storm closed in and the peak became hazy through rain. We saw rain at the upper end of the meadow and watched it advance towards us about as fast as a man could run. It came down in huge drops intermixed with hail. We took our grass and bark sample and turned back somewhat reluctantly. We managed to keep ahead of the rain and reached camp quite dry.

We packed and left the "Hotel Truchas" and drove down the canyon to Truchas. Then we drove north through the fine pine forests of Carson National Forest to Taos.

There we obtained directions and a topo sheet from a gas station attendant and proceeded to the Rio Hondo.

This river forms a narrow v-shaped gap in the massive mountains that culminate in Wheeler Peak (13,100 ft.). We made camp alongside the stream (a swift stream 40-50 ft. wide). Sid chopped a couple of sections off a huge dead pine. We used these as back[?] logs to produce a most pleasant campfire.

While walking along the banks looking for salamanders and I saw several small (4-5 in.) trout. They were all white in the flashlight beam. It is interesting that they should change color phases from day to night. I see no ready explanation.

Notes and specimens took the rest of the time until the cot.

August 8, 1949

Rio Hondo, below Twining, Taos Co., New Mexico

We got up fairly late. I did so because a spring wagon and team started sloshing across the stream. Sid woke up when I started stirring around.

While we were packing to leave, a fisherman walked up (Frank Schultz) and we got into a discussion of radioactivity. He was an oil field foreman. He asked if a small radioactive element might not be fixed to "go devils" (a finned device that fits inside oil pipes and is pushed along by the oil pressure and cleans out accumulated paraffin with its cutting fins). He said sometimes ¼ mile of pipe is ripped up trying to locate a go-devil that has stuck on some inequality of the pipe. With the element and a Geiger the go devil could be located precisely by walking over the pipe line. Probably a single application would save enough labor to pay for the equipment—why not?

We drove 8 or 9 miles up the stream to Twining, a pack station at 9,950 ft. elev. It is situated alongside a green grassy meadow surrounded by groves of tall aspen.

We drove a little farther and then began to hike up an old road, too much in disuse to be driven. We found all sorts of plants in this moist habitat—a huge blue and white columbine, a big blue gentian, skunk cabbage, canterbury bells, all sorts of daisies, thistles, Indian paintbrush, delphiniums, and dozens of less conspicuous forms.

The trail went quite directly up the stream course through fir stands and groves of aspen and grassy meadows. It began to rain and some hail fell. We put on rain coats and continued hiking through the rain. Shortly we saw a black-hatted young fellow carrying a plant press swinging down the trail. He was a botanist from East New Mexico State College. He had attended a summer session at UCLA and taken a course from Chuck Bogart.

He said the hail had gotten him up above timberline and he had turned back. We walked on, reaching a sign saying "Wheeler Peak 6 miles"—the sign at the base of the trail said "Wheeler Peak—5 miles". This was something of a letdown but we continued up turning westward along a good trail that rose rapidly in a series of switchbacks.

We could see the effects of altitude. Plants that were through blooming at 10,000 ft. were in full bloom at 11,000 ft. Of course many plants do not span this change in altitude and many new elements have come in.

Finally timberline was reached just as we hiked past an old copper mine dug into a contact fault. Sid had been feeling the effects of altitude like I had 2 days before (only less) so we took our sample here and climbed to the top of a nearby peak (Bull of the Woods Peak 11,610 ft.). The diversity of small clinging plants at this altitude is amazing.

Composites, lilies, various succulents, and many grasses made up part of the interesting flora. Low, almost reclining closed cone(?) pines clung to the borders of timberline.

The top of "Bull of the Woods Peak" is one jumbled pile of cracked rocks. Sid (Syd.) asked how this came to be. My explanation of cracking due to cold and heat doesn't seem to supply all that is needed by the question. Why is it nothing but a boulder pile with nothing of the matrix exposed?

I enjoyed singing a few old ballads to myself as I hiked down ahead of Syd who was collecting grasses. Syd spotted a weasel and a grouse (which I also saw). Probably I saw nothing because of my singing. The hike down was quite wearing on my legs and took more out of me than the uphill jaunt.

We reached the car and drove to a nice meadow surrounded by aspen alongside the stream. I made camp while Syd pressed our tremendous plant collection (already there are 3 1/2-4 ft. of plants and blotters in the press). I cooked dinner (codfish cakes, potatoes, peas and carrots, and coffee). Note writing and plant pressing occupied the rest of the evening in front of a fine campfire.

At present the skies are quite cloudy but I don't think it will rain on us.

August 9, 1949

Agua Fria Peak, Taos Co., [next page says Colfax Co.] New Mexico

This morning I was the one who slept late. Syd had been up pressing plants for an hour and a half when I got up. Packing and plant pressing were consummated just in time as it began to rain before we had strapped the tarp down. We drove down out of the canyon with gathering clouds behind us. On the flat we ran through a hail storm. Behind us we could see dense storm clouds filling the canyon and hovering over the peaks.

The road lead us to Questa and up the Red River Valley. This valley is a tree filled streamcourse limited on each side by steep cliffs. The Molybdenum Co. of America runs a large mine about 1/2 way up the canyon. Just before leaving the canyon we came to the resort town of Red River to be noted for its high priced food (40 cents for a hamburger) and female tourists.

We left the canyon by ascending a series of 6 or 7 switchbacks up the canyon face and over the ridge at a height of 9,852 ft. We drove down a beautiful wide grassy valley enclosed by pine clad peaks to Eagle's Nest. This town apparently deals in tourists and lumber and sits on the edge of a shallow looking lake that nearly fills the bottom of the valley at this point. A short distance below Eagle's Nest we turned onto a dirt road to "Black Lakes". Rain was falling and the mud was thick and slippery. Even though we went slowly the car slid broadside several times. Some anxious moments were had when we crossed narrow railless bridges.

By use of a contour map we located an old logging road that ascends Agua Fria Peak a considerable distance. Compound low wheel drive was used nearly all the way. We camped in a small meadow at 9,300 ft. Tomorrow we shall try for the top (10,960 ft.) to get radiologic samples. It is suspected that since the bomb cloud passed this way in 1946 that radioactive particles may have been precipitated by rains and dew that fall on these high peaks. Therefore we are climbing the highest ones in the cloud path.

Syd cooked the dinner and went all-out by making french fried potatoes to go with the steak.

I wrote these notes and Syd enjoyed doing nothing in front of a nice hot camp fire.

August 10, 1949

Las Vegas, Mora Co. [next page says San Miguel Co.], New Mexico

We got up fairly early and ate breakfast. Syd was slow about getting ready for the hike and I was urging him along so we could get back before the rains when a pair of horsemen rode into camp. They told us of a logging road (Roy Cartwright's Null??) that went up Agua Fria Peak. Syd sighed with relief and we drove off and up the mountain to about 10,000 ft. I hiked on up to 10,500 ft. while Syd dried blotters.

12:00 PM. We drove down, taking samples as we went and continued on down to Black Lake. After 2 false starts we found State Hwy. 120 leading to Ocate. It was a rocky and bad road but passing through beautiful aspen and yellow pine groves and some wonderful limestone rimmed meadows. Ocate is an interesting town set alongside a high bluff. A mass of green fields cover the long narrow valley floor. It was dusk as we drove along this valley. Finally we came to Las Vegas where we engaged a motel and enjoyed a good long shower.

August 11, 1949

Santa Rosa, Guadalupe Co., New Mexico

We rose late and drove toward Santa Rosa. The road leads through rolling grassland with occasional limestone bluffs covered with pinons and juniper.

We tried to cross La Pintada but a rain the day before had filled it and the road was blocked. We turned back and went to Santa Rosa, took a room and slept.

August 12, 1949

Hope, Eddy County, New Mexico

We left Santa Rosa early and drove south taking several samples and readings at Pastura. I collected a good number of reptiles here. On we drove, across grassy plains toward Vaughn. We had lunch at Vaughn and drove south, steadily losing altitude. ____ miles above Roswell we saw our first *Larrea*.

Roswell is a nice town surrounded by farming districts. Much cotton is grown here. Apparently there is a good supply of water. We drove past farms to Artesia—turned up the Cloudcroft road and camped alongside the Rio Penasco outside of Hope.

August 13, 1949

Sacramento Mts., above Tularosa, Otero Co., New Mexico

We drove up into the foothills of the Sacramento into a gathering storm. Pines begin to replace juniper at about 6,000 ft. and by 7,000 ft. we had driven into a good forest of pines and deciduous oaks. Here just above Mayhill I picked up a specimen of the rare *Eumeces gaigei*, a skink of which 8 or 9 are in collections at present. This was quite a thrill.

At about 8,600 or 8,700 ft. we stopped to inspect some downed Doug-fir logs. Shortly Syd called me over to investigate a strange noise he heard under a large log. The noise was a meadow mouse but under the bark of the log was my first *Plethodon hardyi*.

We took a nice series of 42 animals with little trouble. I was quite surprised at the striking resemblance to *Aneides ferreus*. Chuck keyed them out later and every character fits *Aneides*. Of course he was very excited as he is working on the group for his Ph.D.

Syd and I drove on, after much plant pressing and camped in a wash under a nice cottonwood. I called a poorwill into camp and collected him (with data) for Joe Banner.

August 14, 1949

Socorro, Socorro Co., New Mexico

After breakfast we drove to White Sands National Monument. This is a considerable accumulation of gypsum sand lying in the bottom of the Tularosa basin along its western edge. The basin is a graben[?] and the sand is supposedly wind sorted from erosional products of the surrounding mountains.

The dunes rest on a red sandy soil and are probably 20 miles in length by 10 miles (at the widest) in width. Grain size is about that of granulated sugar. The largest dunes are 30 or 40 ft. high. All the sand is pure white and very hard on the eyes in the bright sun. The gypsum holds moisture readily and an inch or so below the surface the sand is very moist.

I collected a very pale (unnamed) form of *Cnemidophorus perplexus* and a similarly pale form of *Sceloporus undulatus*. Also the pure white *Holbrookia maculata ruthveni*. After a long tedious siege of blotter drying we left and proceeded homeward by way of Carrizozo. We stopped off at the lava beds west of Carrizozo where I collected a very dark *Sceloporus undulatus*. The rest was driving with no events.

August 21, 1949

White Sands New Mexico, Otero Co., New Mexico

Chuck and I left (sub rosa) from the Chupadera Mesa driving directly to the sands. Before we reached the dunes we passed through a large thunder shower which produced torrents of red muddy water among the mesquites and creosote bushes.

It had not rained at the sands but cloud cover and gusts of wind kept the animals in hiding.

We visited the museum and talked with the rangers there. Mr. Johnwell C. H[?].jaris, the superintendant, and a Mr. Ray Schaffner were most helpful to us. Mr. Schaffner has written a thesis on the botany of the sands. A copy is on file at the monument. For geologic information on the sands we were referred to 2 USGS papers: Water Supply Paper 343 "Geology and Water Resources of Tularosa Basin, New Mexico, 1915. O. E. Meinzer and R. F. Hare and Dept. of Int. U.S. Geologic Survey Bull. 794, 1928 "Red Beds and Associated Formations of New Mexico", N. H. Darton (includes a summary of the geology of the state).

From the museum I learned that the Tularosa Basin was formed as a graben valley dropped down along two faults that cut along what are now the scarps of the San Andreas Mts. to the west and the Sacramento Mts. to the east. The gypsum, of which the sands are composed, was deposited by evaporation and concentration of an arm of the sea during Permian times. It was a red bed deposit.

Erosion has exposed lenses of gysum and they have been broken down by wind and water. Some sand (which is denser than ordinary sand) has been produced directly by this means and the rest has been produced by solution and evaporation in a lake (Lake

Lucero) at the base of the San Andreas Mts. abutting the sands. Since gypsum is heavy, wind has deposited it and swept the impurities on out into the basin.

7 species of plants are reputed to grow on the sands themselves. Even these plants do not draw nutriment from the sterile sands but send roots (sometimes 50 ft. long) into the red soil below.

A list of publications consulted in the preparation of the museum is available as: "A Bibliography of National Parks and Monuments West of Mississippi River, Vol. II, 1941, U.S. Dept. of Interior, National Park Service."

We left the headquarters and camped out among the dunes. It is a remarkable place at sunset; the black and rugged San Andreas Mts. silhouetted against the sun. Red and gold clouds and white sand lined with black shadows. At night the white sand reflects all the available light and makes an eerie white effect even under starlight.

August 22, 1949

Foothills of Guadalupe Mts., Eddy Co., New Mexico

We arose, being driven out of the sack by the heat. After a quick breakfast we commenced collecting and shortly took several of the very faded *Sceloporus undulatus* and 3 *Holbrookia m. ruthveni*. It was some time before the *Cnemidophorus perplexus* were in evidence.

Oct. 7, 1949

Palen Dry Lake, Riverside Co., California

Left Westwood about 1:00 PM, and picked up Dick Zweifel and Bill Reeder in our UCLA jeep. We drove out of Los Angeles under a heavy cloud cover. This cover extended to the eastern edge of San Geronio pass. A strong wind blew in the pass and low clouds hung over San Geronio and San Jacinto peaks. It was cold.

We were relieved to find it clear in the Coachella Valley. At dusk we passed through Indio and up toward Desert Center. We drove down a dirt road 8.8 miles past Desert Center and made camp on the flat of Palen Dry Lake, among sand dunes.

[Drawing] In the wash, water is quite close to the surface. Moisture can be reached by digging a very few feet in inches in some places. *Tamarix* and *Salicornia* and *Atriplex* are scattered up and down the wash.

Near Chuckwalla Springs

Imperial Co., California

We arose after a good sleep broken only by two mosquitoes and an inquisitive owl. We ate a hasty breakfast and began searching for gopher burrows. The sky was clouded over and rain appeared to be falling to the west on the Chuckwallas and Eagle mountains. I didn't expect to find *Uma* in this sort of weather but Dick kicked a big male out and saw him run down a burrow. We caught him and drove some more, locating some green *Tamarix* in moist soil at the south edge of the lake—still no gophers (Bill Reeder is interested in them).

We drove up to the highway and up a good desert road southward up the bajada of the Little Chuckwalla Mts. into a deep canyon with a sandy bottom. *Olneya*, catsclaw (*Acacia*), *Larrea*, mesquite, *Chilopsis*, etc. were lush in the canyon bottom. Shortly

(about 10 miles from the highway) we came to Corn Springs. It is a palm oasis of some 60 trees (mostly with their skirts burnt) situated in almost the center of the canyo. A concrete pipe about 3 ft. across is run into the ground about 5 ft. to a seepage. This was dry. Mesquites are numerous and a quail guzzler has been built.

We drove on up the creek past several shacks 3 miles to Aztec Well where we met John Garza, an old miner who has lived in this canyon since 1927. He is a very pleasant rotund gentleman and was listening to the World Series at he time (Yanks over Brooklyn 3-0). We quizzed him about *Bufo punctatus*. He told us they were common in the area (not at Aztec Well) and could be found in a steep-walled canyon near the Morningstar Mine about 1 mile away.

We drove down the road and cut off on what we took to be the right road. We ended up at a little shack. Bill called and presently out came a most disheveled being who ignored Bill and commenced to urinate—oblivious to us. When he finished he started to go back in the house—only then did he see us. He seemed relatively unconcerned. He was a remarkable fellow for his outfit. You could see his feet through his shoes in several places. A red face and a large nose, dime store glasses so dirty I could hardly see his eyes. He was hard of hearing but finally directed us to the mine. Dick drove us up a horrible rocky road to a steep canyon cut into the granite. High boulders formed the walls. We hiked up over the falls but found no water. *Bufo* could occur here under the same circumstances as it occurs in the Granite Mts. We took a couple of mummified *Bufo* from Corn Springs. They had been trapped in 2 shallow tanks and had desiccated.

Lunch was eaten at Corn Springs and we drove on down to the highway and Hopkins Well. This place is now abandoned and the beaten old tank and some *Tamarix* trees are all that remain.

We took a road out onto the north end of the lake. The soil is moist here and filled with gopher burrows. *Tamarix* trees form about the only vegetation in most places. These are small and shrubby. We drove on to the area of sand dunes and located 6 *Uma scoparia* by tracking. Clouds had come up and a dust storm was brewing over the south end of Palen Lake. As a consequence no *Uma* were out. We left and bought gas and started up toward Wiley Well. The south side of the road supports a good area of sand dunes habitable to *Uma*. The jeep had some trouble but we made it to Wiley Well. The well is a tank of good water (considerable algae) running from a windmill. The water was down about 40 ft. Ironwoods filled the wash around the well. We drove on and tried to find Chuckwalla Well but the road gave way to a mess of vague General Patton roads. We ate dinner and are now sitting around a nice ironwood fire.

[Drawing]

January/February 1950
March 1950
April 1950
August 1950

Sonora, Mexico
Baja California, Mexico, Arizona
San Bernardino Co, Panamint Mts. ...
Guracoba trip (Sonora, Mexico), Arizona

January 17, 1950

Gila Bend, Arizona

Packed and left Los Angeles about 12:30 PM. We drove to West Covina and had lunch. Two trucks, a Dodge power wagon, and a Dodge pick-up were taken. We have a full rig for fish collecting including dip-nets, seines (including a 160 ft. one), 80+ 5 gallon cans, 2 30 gallon drums (for large specimens), 6 cans of derris root (for poisoning tide pools) and numerous other items.

In the party are Dr. Boyd Walker, Dave Joseph, Art Flechsig, Andy Rechnitzer, and myself.

We drove on across the Coachella Valley having dinner at El Centro and continued on to just east of Gila Bend where we camped (hastily) at 2:30 AM.

January 18, 1950

South of Nogales, about 20 miles, Sonora, Mexico

We were awakened about 7AM by an irate real estate man who complained that we were decreasing the value of his property. We packed up and left (how we could decrease the value of his creosote and saguaro land I cannot see). We drove on toward Casa Grande through farming country—many cotton fields, with just the stalks standing. After a good breakfast we drove south toward Tucson through a broad valley surrounded by disjunct volcanic ranges, some of which (Desert Peak and Santa Rita Mts.) had a little snow on their north summits. Alternate stretches of desert and farm land cover the valley.

Tucson is flanked on all approaches by numerous motels of all sorts, some very elaborate.

We left after much fooling around (buying dynamite and tire tools and fan belts (one had broken out of Yuma).

Crossing the border was surprisingly easy—a few pesos or promises of same apparently greased the way.

We drove through a peculiar area of rolling hills and spare oaks (look somewhat like valley oaks) and overgrazed grass. We camped in a thicket of some sort of mesquite, ate a quick dinner, and wrote these vital words.

January 19, 1950

Guaymas, Sonora, Mexico (Miramar Beach)

The temperature had dropped considerably during the night and we got up in a cold wind. We ate a fine breakfast of pancakes and bacon. Shortly we got the show on the road and started off driving through a valley filled with a forest of mesquites and palo verdes.

The big truck stopped along a big cottonwood lined wash at Muris, where we could see 2 women washing clothes along the small stream that wound across the

streambed. We seined the stream, at some expense to our dry clothing and caught 2 *Cyprinid* fish and a *Cyprinodont* fish (Poeciliid). The males of the latter have a long intermittent anal fin. They look like mosquito fish but are slimmer and more colorful. One of the cyprinids had heeding[?] tubercles on the top of the head and on pectoral and anal fins. These tubercles (on head) looked pale blue in color. The other fish had dark longitudinal lines down the side and reddish pectoral bases.

The creek was full of burro "end products" but we perservered and collected a fine series.

The country was covered with a dense forest of mesquite and palo verde. A jagged north-south ridge of volcanic origin rose on either side of the alluvium filled valley. Tree morning glories (in bloom) began to appear in increasing numbers.

Shortly we came to Magdalena. This town is a sprawling village lying in a broad river bottom. We could see the dome of a cathedral above the palms and street trees.

After leaving Magdalena I saw my first palo blanco growing on a boulder strewn volcanic slope.

After crossing a section of dusty dirt road we dropped over a low ridge and down into the town of Hermosillo. At first it looked very hot and dusty but shortly we began passing clean modern buildings. There is a nice park and at least 2 beautiful cathedrals. Also several clean modern motor courts were seen.

A new hotel covering an entire block has just been completed. We bought insurance for the cars and mailed post cards. We were all amazed at the number of pretty girls wandering around and we haven't been out long enough for it to be an artifact.

We drove on, passing over the Sonora River just out of town. It is quite a stream of water for a desert region such as this. In the city of Hermosillo the stream is restricted to a channel about 40 ft. across.

Out of Hermosillo the road passes again through volcanic terrain clothed with mesquite, palo verde, and numerous wispy palo blancos up on the slopes.

We have been losing altitude continually from Nogales (3,950 ft.), Hermosillo (690+ ft.), and Guaymas (+2 ft.). A dense, symmetrically rounded tree (30-40 ft. high) began to appear in washes. It has a thick trunk and dark green leaves which are spirally arranged around the stem. The leaves are thick, glabrous above, and ribbed below. The stems are whitish [drawing]. For some reason I suspect it is an Asclepiadaceous plant.

As sunset approached we drove up and around a precipitous volcanic range. We crossed through a low divide and dropped down into the alluvial fan at the head of Miramar Bay. The sky was yellow and silhouetted against black, jagged peaks with a blue tidal lagoon visible down the valley. A long sand spit cuts this lagoon off from the Ensenada Bocoibampo except for a narrow channel at the north. A row of beach cottages stood black against the sky with yellow lights shining from their windows. This scene combined with a warm night created a most pleasant welcome to the gulf.

We drove out to the end of the spit and with the permission of a fine fellow named Jesse we made camp in his parking lot. He is a bartender and lays claim to being an ordained minister, a medical student who quit to get married, and an interior decorator.

We ate a rather hasty dinner and went seining. All sorts of interesting fish were taken. Bonefish larvae were taken on the first haul. They are transparent (like glass) with a small head and a long body. No internal organs other than eyes can be seen. They shrink when they metamorphose. [Drawing] We took several large-sealed flat fish

(*Etropus*). Sand lances were taken. These are peculiar fish with the mouth opening on the top of their head [drawing].

We took a grunion (*Hubbsiella*) in quantity and of course Boyd was excited. He observed them coming up on the beach to spawn (the first such observation on this fish).

We seined in the lagoon inlet and on the sandy beach. Several new species were added to the list before we hit the sack at about 11 PM. Booyd stayed up for the grunion run, which took place at 1:30 AM.

Before we went to bed, Boyd, Dave, and I cooked up a mess of mullet, which was excellent, particularly considering our starved condition. With a cup of coffee we had a real meal.

January 20, 1950

Guaymas (Miramar Beach), Sonora, Mexico

I got kicked out of my sack at some early hour. Boyd went in town to see the Fisheries Commission people. The rest of us stayed and seined. We took the boat over to a rather secluded beach and set the 100 ft. seine. Before long we had a crowd of school children watching us. Our seine brought in three baby botete (puffers) and that is all.

We also had an audience of people who were staying at the Coronado ____ Hotel and who proclaimed the food there "simply vile". The woman had buck teeth and a British accent. She would have looked well on a shooting stick.

Another haul succeeded only in getting our net tangled among the rocks.

After stowing the seine we took the boat to the beach along the sand spit where we are camped and made 3 hauls. Great quantities of thread herring, several very large mullet, and 7 or 8 other species. We took several stingrays, 2 good sized butterfly rays, and a guitar fish.

We were all a bit "pooped" when we got back to camp. Shortly Boyd returned and we ate dinner. Boyd, Dave, and I went out in the lagoon and caught several new (to us) forms. I saw my first eel. We caught a most peculiar attenuated goby among the roots of mangroves where they were covered with moss.

Gillichthys (a goby) was taken. It seems to be strictly nocturnal as I saw none during the day. Apparently they hide in holes in the mud during low tide.

So far we have seined several *Uranosopus*?, a star gazer. They are worthy of a note. These little fish (6 inches or so) live in the sand. When placed on the beach they make peculiar undulating movements with their pectoral fins. The anterior edge of each fin is dipped down in a scooping motion. The median anal fin is equipped with hooks on its anterior spines (ray?) and is moved back and forth in such a manner as to dig the fish into the sand [drawing].

It has filamentous processes? which cover its mouth with a sort of meshwork—this must be a specific adaptation to its particular food supply. After our goby hunting expedition we hit the sack (most willingly).

January 21, 1950

Guaymas (Miramar Beach), Sonora, Mexico

I was again unceremoniously disturbed at some unmentionable hour. Boyd and Art were going in town to see the fisheries people as Art is going out on their boat for 5 days while they are doing experimental trawling for shrimp.

Dave and Andy and I took the boat and some dynamite and went out in the bay collecting. Three tries netted us 1 fish—a *Haemulid* (grunt). We ran the boat all around the bay and landed on one island but saw very few fish. Finally Dave tossed a stick into a pool near some rocks and we picked up a gunny sack full of 4 or 5 lb. fish including a trigger fish.

We came back for gas but a pin sheared in the outboard so we have ceased operations for the time being. I think I'll knock this off and go have a cerveza (Carta Blanca).

We had a fine dinner of the croakers—fried quickly in very hot fat. The fish was cut into small pieces (about 2 bites) and dipped in pancake flour first.

Boyd and Art arrive, after having done some poisoning in a rocky area south of camp.

We dropped over to Jesse's bar for a few beers. Jesse's helper, Manuel, asked us our names. Art's was Arturo, Andy's was Andreas, Dave was Dah-veed, and I was Kenuto—but nothing could be done with Boyd. There isn't any way of making a spanish name out of "Boyd."

Dave asked me the name for bird. I told him "pajaro"—so he flapped his arms and said "pajaro". Jesse, who speaks very good english, said "Brooklyn" and laughed. Then Jesse told Manuel. Manuel was shocked to think that students would think of taking such liberties with their professors. Apparently spanish professors are placed on pedestals and revered by their students.

Art purchased a "submarino", which is a concoction composed of a shot glass full of tequila inside a glass of beer. We all were glowing like neon sighs when we left for night seining.

We worked the sandy beach by camp with a 100 ft. seine. The seine is piled carefully in the stern of the rowboat and the oarsman rows out to the limit of the seine rope. He then cuts at right angles and parallels the shore while a net man pays the net out throwing the bag to seaward. When all the seine is out the boat is turned inshore and the ropes are pulled in, 2 men on each rope.

A set looks like this: [drawing]

Seining is hard work but the sight of mullet jumping over the net or of the excitement when the bag is laid open more than compensates. We took a good many large jacks or "el toro" as the Mexicans call it. They look something like this [drawing].

We collected a number of interesting fish including a bat ray (*Holorhina*) and a salt water catfish (Andy picked it up in the surf).

Dave and I rowed the boat back which was another pleasant task. When we got to the truck it was about 12:45 AM. All of us were hungry after our work so we cleaned and cooked 3 big jacks and they were really fine. Each fish tastes better than the last and all taste far better than anything you can buy in stores or restaurants.

January 23, 1950

Rio Muerto, near the sea, Sonora, Mexico

Andy and Dave and I got to sleep late as Boyd and Art had gone to Guaymas to start Art on his sea trip.

We cleaned up camp and fixed fish (I am getting sensitive to formaldehyde as my hands are all cut up). While washing the boat I noticed that something was wriggling in the sand. It was an amphioxus (*Branchiostoma*) or lancelet. They are primitive chordates but have no true backbone. Andy collected about 8 more by digging in the sand near the water's edge.

Boyd returned and we left for Guaymas.

Guaymas has some nice houses on its northern outskirts and some terribly poor cardboard, mud, and stick dwellings on its south side. There seems to be little in the way of a middle class in Mexico. Either a Mexican has lots of money or none.

Guaymas is a dusty, dirt-streeted place with the typical iron grilles over the windows and the calsonined adobes. The main street sports a center section of nice shade trees and a couple of statues of unknown (to me) but dignified looking Mexicans and an obelisk dedicated to some other unknown person too horrible to remember by a statue.

Guaymas Bay is a beautiful harbor surrounded by a rather intricate series of islands and peninsulae. Several sport fishing craft were at anchor and one small (about 5,000 ton) steamer was tied up in the bay.

We tried to get a Mexican calendar (which are real works of art—for example one has a scantily clad female in a transparent dress with a rose clenched prettily in her teeth).

Boyd had decided to try to reach the mouth of the Rio Yaqui to do some estuary work so we drove southward, becoming quite entangled in the town of Empalme. I did not like Empalme. It has nothing charming about it. It is a dirty squalid mess and even the people didn't seem very friendly. Finally we got out of Empalme and drove southward. Another stretch of the paved road is being built here. It will be a fine road when it is done.

Shortly we had to revert to the old dirt road but it isn't a bad road by Mexican standards.

At Pitahaya we inquired of some young Indians about a road to Rio Muerto. They showed us a road and then hitched a ride on our trucks. We rode off through the mesquite to a little pueblo of wattle and bamboo shacks centered around a large brick church with an impressive dome. Our riders left us here and we were given directions. We drove off over a flat plain, alternately covered with dense mesquite thickets and open mud flood plains. In the darkness the effect was rather weird. Before long we came to an old ruined adobe along the river bank. Here the river is subject to the tides and is salty. Broad gooey mud flats border a stream about 100 ft. across.

The ground was damp and crusty with salt all around so we drove on. It became apparent that we were on a oyster fisherman's road. After about 5 or 6 miles we came to some large mangrove trees alongside the Rio Muerto and stopped to make camp.

The place was set on the bend of the river and was a camp spot for oyster fishermen judging by the piles of shells and the boat tied to a mangrove.

After a quick dinner of meatballs and rice and asparagus soup everybody went to bed except me. I went fishing and caught nothing, had no bites but got neatly covered with mud. I wrote notes and hit the sack.

January 24, 1950

Rio Yaqui near Vicam, Sonora, Mexico

We got up fairly early, had our pancakes and began collecting. Andy, Dave, and I went out in the boat and dropped ½ a stick of dynamite. When it went off the fish leapt out of the water all over the stream. Another blast killed a good many fish, mostly anchovies and herring. A 3-stick blast brought in other species.

We seined up and down the river, using a 50 ft. and 100 ft. seine. The river is about 200 ft. wide at this point and has a very mucky, muddy bottom. The banks are lined in places with dense growths of mangroves. *Salicornia* (pickleweed) is a common plant in the area. Back of the river the flood plain is as flat as a pool table.

There are many species of shore birds along the banks. We saw great blue herons, long billed curlews, terns (a small white species with a black bar through its eye), a willet-like bird, and some small sandpipers?

I saw a small kinglet-like bird with a yellow breast, olive wings, and a rusty red cap on its head.

Wading in the muck while pulling the seine was hard work so we all ate a good lunch and went back to work. We made a fine collection and returned to camp, packed up, and left by 4:00 PM.

Back on the highway (graded gravel) we drove southward over the alluvial plain. Many pitahaya cacti covered the terrain, among mesquites. Volcanic mountains form the eastern limit of this plain. Apparently much of the lowland area is covered in times of flood by the Rio Yaqui. Floods occur mostly during August—so we were told.

Black vultures and caracaras were common, most often perched on large cacti.

At Vicam we drove westward toward the Rio Yaqui. We passed a small village and drove into a dense forest of mesquites, cacti, vines, *Baccharis*, and numerous unknown plants.

In one place we had to chop away a limb to allow the boat to pass under. After passing many mud houses with cooking fires flickering through the doorways, we cut off toward the river on a cart road through dense stands of bamboo?

Shortly we came to a grove of huge cottonwoods close to the river. We stopped, made camp, and cooked dinner. A pleasant campfire made this spot into a perfect camp. Note writing and work on the fish completed the day's work.

The river is a fast flowing river of large size (about 100 ft.). Steep banks rise from the river in places. Boyd and Dave saw a flight of parrots go over.

Enough for tonight.

January 25, 1950

Near Mapoli, Sonora, Mexico

About 5 AM we all awoke reluctantly because of a drizzling rain. I was the most reluctant of all because the dinner of the night before was not sitting too well and I was feeling low. Because of the poor road, which crosses lowlands, we thought it best to get to the main road before our cart-road got muddy.

On the way out we were better able to see the forest we had passed through the evening before. It is a dense forest of huge mesquites (some 30 ft. or so high), bamboo thickets, and patches of solid *Opuntia*. Also there are many cordons and pitahaya cacti

scattered among the other plants. In very few places, other than on roads could a horse be ridden through this jungle. Scattered through this forest are the shacks of Yaqui Indians. The houses are constructed of sticks and mud wattling with thatched roofs. Apparently, these Indians live chiefly from goat herding.

The rain did not materialise. We drove on toward Cocorit. At the Rio Yaqui we were ferried across. The ferry was a barge of about 4 passenger car capacity. It was suspended on a big cable and was propelled by a Mexican pushing a long pole in the river bottom. We paid them 7 pesos for both trucks.

Just over the river a little way is the town of Cocorit. It is a typical spanish town with its adobe houses and town square. A big man in a plaid shirt rode by on horseback. We asked him where we should go to get fish from the Rio Yaqui. He replied in English—it turned out that he had lived on Western Avenue in Los Angeles for a number of years.

Two other fellows were with him, one the town “pill doctor” did not speak English and the other a boat builder named Leonardo spoke very well. The horseman’s name was Nat. Both he and Leonardo volunteered directions and offered to go as guides. Leonardo said he knew where there were all sorts of fish. Since he talked louder and more often than Nat we followed his advice (a bad move) and set off, after getting gas, for Buena Vista.

Andy, Leonardo, and I drove in the Power Wagon. We crossed the ferry again and cut off toward the hills on a beat up dirt road. We drove 10½ miles on this road. Leonardo told us he had lived in El Paso for a few years until 1930. He pointed out a cactus whose spines were used for ladies dress combs. He also showed us the pitahaya cactus which is used for food (the cactus apples) in early summer. He also showed us the palo santo (tree morning glory). Leonardo told us a number of tales of his importance. He claimed to own several shrimp boats and to make 78 cents a pound on shrimp.

From the looks of his house at Buena Vista, the stories must have been stretched somewhat. After our drive we drove up to the little town of Buena Vista. The bell tower of an old Spanish church stands on the crest of the highest hill in town. Leonardo told us a Spanish bishop had been buried in the foundation with all his wealth (doubloons). Leonardo said he dug in the foundations at night sometimes looking for the treasure.

Below this central hill are the remains of an old fort. Several Mexican families live in the various parts of the fort. We drove down to the river’s edge and did a little seining. It was not one bit better than the river at the ferry. We realized, as we had suspected, that we had brought Leonardo home. He informed us that we could get back on a much better road if we got a permit from the engineers constructing the Yaqui River dam.

Nat (a rugged handsome fellow) went along with us. He was quite a guy. He had a couple of bullet wounds from fighting Yaquis. He owned 4,228 hectares along the Rio Yaqui (about 2¼ acres to a hectare).

At the dam we met an engineer who spoke perfect english. In spite of our filthy condition he treated us very well and gave us our permit. He said the Yaqui dam was the largest dam in Latin America. It goes down 128 ft. to bedrock and contains about 1/12 the material of Boulder Dam. With the dam the lower Yaqui Valley will be irrigated and the flood danger during August and September will be minimised. He showed us a wall

map of Sonora—Secretaria Agricultura y Fomento, Dirrection de Geografia, Metreologia and Hydrographia—1941. It is a fine map in some respects.

We drove off past the dam (nearing completion) and over a bridge and out on a much better road. Nat directed us to a place where the river was dammed and partly diverted into a drainage channel. Here we found some back water areas and sloughs. Dave and I dragged a common sense seine through some muddy pools. We were up to our knees at times but we caught some new forms—one is a goby like fish with jaws like a eleatrid pike. Also we caught 3 turtles (*Pseudomemmys*), 2 of which got away.

Back in Cocorit we bought a tequila for Nat and had one for ourselves. We said goodbye and drove to the ferry, paid our 3rd 7 pesos for the day. We drove on until we came to Mapoli and camped on a flat a little ways off the road. The sack felt mighty good.

January 26, 1950

Estero San Carlos, Sonora, Mexico

We woke up early and started off up the road toward Guaymas. At 1 roadside pool we tried a stick of dynamite with no results other than a tall spout of water. Up the road a little farther we stopped to seine the pool where we had taken *Elops* in on the way down.

The pool was the result of drying of a tributary of the Rio Muerto with consequent concentration of the fish fauna. A long (150 yards) shallow pool lined with reeds leads down to a 4 ft. deep rocky pool under a railroad culvert. A shallow pool goes to the edge of the main road. On the other side of the road a channel goes west for an unknown distance.

Boyd dipped a common sense seine in the pool by the culvert. He brought up about 5 *Dormitator* (a goby) weighing ½ lb. Or so. I walked across the pool and could feel fish swimming under my feet at nearly every step. Dave and Andy and I seined the pools and brought up a tremendous amount of fish. With a common sense (10 ft. seine) we could bring up 25 lbs. of gobys at a try. We caught a good many sunfish (*Lepomis megalotis*), a fine series of *Ictaluris* (a catfish), a big series of *Elops*, and some big carp among other things.

For 1 small pool it was tremendously productive.

Empalme didn't look so bad on the way back. There are some huge shade trees in town that make up somewhat for its other defects.

At Guaymas I got bread while the others gassed the trucks. It was siesta time and so we couldn't get any vino.

We drove on north of Guaymas, past the Miramar Beach Rd., past the airport, to a dirt road that cuts off to the left over a low saddle. Before long we came to a rancho where a boy was pulling water up from a shallow well. He was on horseback pulling a rope over a pulley. For a bucket a hide was strung on a hoop about 1 ½ ft. across. An older fellow was dumping the water into a trough. They told us directions to Estero Soldado and to Estero San Carlos [drawing].

We drove on past a big sandy beach to the edge of Estero San Carlos. It is a most beautiful place. The Estero is a fairly large bay walled by steep volcanic peaks. North west of the bay a rugged peak rises from the edge of the gulf. It is topped by a big pinnacle of considerable height. This mountain can be seen for some distance in some

directions. We could see it at Miramar Beach. After taking a small side road we camped back of the beach by a little crescentic bay near the mouth of Estero San Carlos.

Dave and I tried poisoning a poor tide pool while Boyd and Andy went out in the boat to try their hand at dynamiting. Neither of our groups did very well. However, the dynamite produced fish for dinner.

After dinner we took the boat and some dynamite and tried some night blasts. We got our first *Apogomid*, a beautiful little red fish. Around the point Andy dropped a line and shortly came up with a beautiful red snapper (*Lutjonidae*). A little later he brought up another. All the rest of us could do was get a few bites. We returned and hit the sack.

June 27, 1950

Estero San Carlos, Sonora, Mexico

After our usual tasty breakfast of fruit juice, bacon, and pancakes we took the boat up and around the Estero. Later Andy and I located a beautiful big tide pool at the mouth of the bay. A shelf runs out about 50 ft. from the base of a big cliff. On this shelf is a big pool that is 6 ft. deep in places. We poisoned the whole pool and made a really fine collection including such things as a grouper with electric blue outline ocelli (*Cirrhites*), more cardinal fish, a big moray eel, a butterfly fish (*Centropyge passeri*) with an orange tail, a blue bar back of his pectoral fin, and neon blue fringes on his fins, and a parrot fish decorated with stripes of magenta, blue and green.

Since tide pools of this sort are hard to find in the gulf, Boyd and the rest of us were very pleased.

We returned cold and tired to camp. Dave who had gone to town to pick up supplies (food and porto and tequila), met us on the beach. We drank a slug of tequila. It is really fine at times like this. It warms you and makes everything seem better. Dave brought letters and news that he had passed his Ph.D. qualifying but no news about Andy's fate or mine. We had more tequila and then dinner and then went fishing.

Everyone was a little rosy by this time, particularly me (as I remember it). Before long I was really out of it and never even bothered to disentangle my fish line. In spite of a vicious looking mess of line and hook I managed to land 2 bass. Boyd caught a great freak of a fish with a huge mouth which I insisted (with no one disagreeing) was a *Neoclinus* (*Opisthognathus*). Apparently I had quite an argument with myself. Back in camp we all hit the sack at once.

January 28, 1950

Estero San Carlos, Sonora, Mexico

In the morning I found that one can drink too much tequila, even if it does cost only 70 cents a bottle. Leaving my sleeping bag became a major issue and staying out was one for the rest of the day. If the others were as bad off as I was they didn't show it, though Boyd said he felt a little crummy.

I slit fish and cleaned up camp in the morning with Boyd while Dave and Andy took the boat over to the pool and picked up fish. In the afternoon we all poisoned and collected some smaller tide pools close to camp. Boyd drove to town to pick up Art.

At dusk Dave and Andy and I returned to camp and built a fire. We were all tired and so we did nothing for about an hour, enjoying the leisure. None of us thought we wanted to go fishing this night.

Boyd returned just after we had finished dinner and told us Art was still at sea trawling for shrimp. Boyd wanted to go fishing so we all weakened and went along.

In the water we could see thousands of ctenophores (conch jellies) glowing with their cold light. A flashlight beam in the water revealed tremendous quantities of decapods (little shrimps—possibly Euphasids). In one place they were so thick they looked like rain as they leapt out of the water. Some of them glowed with a bright greenish light. We caught no fish—returned to camp and went quickly to sleep.

January 29, 1950

Estero San Carlos, Sonora, Mexico

This morning dawned brighter and better than yesterday's for me. With breakfast over we piled the seine in the boat and drove the boat to a sand beach east of camp. The first haul was through beds of sea lettuce. We netted a large quantity of fish but had so much algae too that we had to throw it up on the beach before we could land the net. Sorting it all took about ½ an hour.

Our next haul was over sand. Dave and I saw a big school of anchovy before setting the net. We thought we had missed them but when the bag came in it was bulging with flapping fish—nearly all anchovies. We released about ¾'s of them. We took some of the rest of them for collection, took a gunny sack full for chum, and still left the beach covered with them for the gulls who promptly came swarming around.

As we rowed down the beach a big pelican swooped in and began scopping fish off the beach with sidewise swipes of his bill. He then raised his head and gulped the contents of his pouch as they slid down his gullet.

After lunch we poisoned a big rocky shelf adjacent to the beach. A beautiful little red headed goby proved quite common. Their heads are bright red with blue lines, one through the eye. These little fish frequent the holes in the rock occupied by sea urchins.

Boyd took a *Lythripus*, a little red fish previously reported from Southern California.

Back at camp I tried to cook a sea cucumber. They have a considerable quantity of white meat that looks like abalone. I diced him and tried to fry the meat. It shrivelled and rolled up in a ball. I tried it and found it the most resistant meat I ever tried—it was just like a tough rubber band. They might be good if beaten thoroughly.

After dinner Dave, Andy, Boyd, and I went fishing again. We had hardly lowered our lines to the bottom when the fish began hitting. We hauled them in and they proved to be red snappers. Poor Dave was all fouled up. Either he was hooked to the bottom or tangled in the fish sack. The 3 of us caught about 18 fish before he got a bite. It proved to be an irate octopus. Finally he brought in a fish and joined us. We caught about 25 snappers and some bass (*Paralabrax*). We came in about 1:30 AM. Boyd and I fried up some fish (snapper). It was really delicious. We hit the sack a little later.

January 30, 1950

Estero San Carlos, Sonora, Mexico

We got up quite late and I filleted a lot of the snappers. Some fellows from UCLA are camped on the beach. We gave them snappers. They said they would get us some lobsters.

We poisoned a big pool and collected a good series of fishes. It began to rain a little and by evening a drizzle was coming down quite regularly. We hit the hay under a big tarp.

Boyd and I had been wiping our fishy hands on the legs of our pants and before long we began to smell them. Andy, in particular, did a lot of groaning about the stench.

January 31, 1950

Estero San Carlos, Sonora, Mexico

Boyd went to Guaymas to go trawling on the Instituto de Pesca's boat. The rest of us took the boat and the 100 ft. seine and went to the Estero Soldado.

It is a long trip by boat. We passed about 3 or 4 miles of beach before coming to the narrow shallow entrance to the lagoon. The tide was going out and a current of about 3 mph flowed against us as we entered. Just back of the entrance the lagoon splits into 2 channels both of which wind in various directions and open into a broad shallow flat north of the entrance.

In many places the lagoon is edged with mangroves. These trees harbor a sparse population of oysters on their roots.

We seined the channel in 4 places obtaining several rays (*Dasyatis*) and a fair series of very large *Colpichthyys*, a smelt-like fish. Also we took lancelets and a few other forms.

After leaving the lagoon, we made 1 beach seine haul and headed for home. A wind had come up making the sea very choppy and the air cold.

Art warmed our frozen feet by pouring warm water from the outboard exhaust over us. It felt wonderful but we had to bail out the boat at intervals.

After dinner we went fishing (Art, Boyd, and I) and caught some interesting fish. I caught a fairly large shark (3 ½ ft.). Art brought in 3 big (1 ½ lbs.) blenny like fish with a mouth so large he could grasp a fish as big as himself. We returned to camp and hit the sack.

February 1, 1950

Estero San Carlos, Sonora, Mexico

We got up fairly late. Boyd went to Guaymas again to go trawling.

None of us was feeling like a tiger and Andy was lowest of all but we loaded the boat and left for San Carlos Bay. After a couple of seine hauls we stopped to eat lunch—but Dave had left the lunch bag on the beach at camp. Not only that but the seine had rolled in the eel grass and become very tangled.

Our patience was getting tried more than we appreciated. Andy walked back to camp over the hills while Art and Dave and I took the boat around. When we arrived at camp I discovered we had left a seine braile back in the bay.

After lunch (the chocolate had melted in the sun) Andy went back for the braile while the 3 of us set out to poison a tide pool.

While climbing over some rocks Dave slipped and fell, cutting his chin open about 4 stitches worth. Art left me on some rocks with the poison and took Dave back to camp.

I found some deep semi open pools and poisoned them liberally. Before long a great many brilliant little red cardinal fish (*Apogonids*) began rising. Then numbers of

brilliant red squirrel fish (*Myrispristis*) came to the surface. Art returned and we made a fine collection including 5 forms we had not taken before.

After dinner we went fishing without much success except that I hauled up an octopus and while it was hanging on my line it squirted its sepia. The stream hit Andy square in the mouth and got all over his face and coat.

Back at camp I learned that I was going out on the Instituto boat in the morning.

February 2, 1950

Miramar Beach, Near Guaymas, Sonora, Mexico

Boyd and I left camp early, leaving the others to pack up. We drove to town, unloaded the truck, and boarded the boat. It is a converted yacht built in San Diego. Rene Nunez, the biologist for the Instituto was in charge. He is a young fellow, who speaks English well. He had studied at Stanford under Rolf Bolin.

The Boat has a large central boom equipped with lights and 2 smaller booms (like davits). 2 masts are forward of the deck house which is placed aft. A winch and cable are used to tow the shrimp trawl (30 ft. across wings) used on the boat. The stern is quite pointed and makes little wake as it passes through the water. A gray marine diesel powers the ship. Rene said it was purchased for 15,000 pesos (about 2,000 dollars) by the Instituto.

We passed out of the bay and picked up a shark line that had been set the day before. 2 floats marked its ends. The line is composed of half inch hemp rope with very large hooks tied on with the same material. Anchors hold the ends of the line in place. We hauled it in and found 3 sharks and a batray. 2 of the sharks had been eaten by hagfish (*Polistotrema*). This fish burrows in the side of the fish and eats out the viscera. About 32 hooks were set which must have had a 3 inch gap. Large thread herring were used or bat.

The try net was then set. This is a small (10 ft. across the wing) net used by shrimp fishermen to sample the bottom before lowering the big nets [drawing].

2 boards are hooked, 1 on either wing to spread the net. This is the same design as the bigger nets.

We collected a lot of flat fish and grunts (*Haemulidae*).

Rene had some work to do at the office, so we started in. He has 3 crew members, 2 seamen, and a cook. All were fine fellows. The seamen were young kids. 1 went up steel guy lines, hand over hand with no apparent effort.

After reloading we left for Miramar Beach. The power wagon appeared in town and we went out to Miramar together. Camp was made alongside the bar again and we immediately dropped in for a couple of Carta Blancas. Manuel was there but Jesse was on his day off.

After dinner Boyd announced we would leave for Kino Bay tomorrow if it was O.K. with everybody. It was O.K. with everybody. Andy started moving things like a mad man. Dave and Art also looked like new men. Obviously we had been in 1 place too long.

With our preparations finished we went to bed—all except Boyd who went out to watch grunion.

February 3, 1950

Bahia Kino, Sonora, Mexico

After going to Guaymas, mailing cards, and getting gas we drove northward toward Hermosillo. After lunch along the road I piled in the back of the power wagon and slept until we reached town.

Numerous directions finally got us on the Kino Bay road. Yaz St. is taken north almost out of town to Calle Mesa Grande? This is taken west toward the gulf. The road is a dusty dirt road that is sometimes quite good and sometimes poor with high centers. It passes down the Sonora River wash. There is no channel near the road but there is a flood plain covered with a forest of palo verdes and mesquites. Some rather large fields of wheat edge the road just west of Hermosillo.

Several miles west of town we passed a pair of wagons pulled by burros. A whole family of Mexicans and all their belongings were in the wagons.

Where they could be migrating in this desert is hard to see. The truck scraped bottom in a few places but we got through all right.

After many miles in the dust we emerged onto an undulating plain which became increasingly sandy as we approached the bay. About 6 miles from the bay the accumulations became deep enough to support *Uma*, should it occur here.

We could see a series of jagged peaks to the north and a few scattered peaks to the south jutting up over the plain. Amangrove-like plant with thick ovate leaves [drawing] .

..

Suddenly we saw the gulf and a long crescentic bay lined by a long sand beach. 5 minutes more and we drove into Kino Bay.

Kino is a real fishing camp. The poor road has eliminated most of the turista influence. A number of adobe shacks, in various stages of decay compose the town. There are no areas which are really the streets but the dirt is packed around all the adobes and one may drive where he pleases.

A large portion of the population came out to see us enter. We had a man open the tavern and give us a beer. This building is one of the few frame buildings.

Several interesting Mexican calendars are tacked on the walls. 3 pool tables are blocked up on the dirt floor. We drove a little north of town out among the sand hills. These dunes occupy the edge of the beach back a variable distance—50 yards to 200 yards approximately—in a crescent around Kino Bay from a rocky promontory on the north about 3 or 4 miles above town, to a southern rocky point southward and seaward from the Laguna de la Cruz. The sand is quite fine and monderately densely vegetated, chiefly by a succulent plant resembling a small elephant tree.

Dunes reach their greatest heights right along the beach where some are 50 ft. high. In some places there is considerable shell material mixed in the sand. *Callisaurus*, *Uta*, and *Urosaurus* were seen but no *Uma*. There were no large lizards out and it is highly possible that *Uma* occurs here but has not yet emerged from winter hibernation. The habitat seems wholly suitable for *Uma*.

We made camp, ate dinner, and commenced seining the shallow water off the beach. Our first haul brought in a flapping mess of very larg rays (*Holorhinus*). In no time they had their stingers entangled in the net and it took about 20 minutes before they were worked loose. Several hauls brought in more of these big fish. Some were easily a yard in width with a stinger 3 in. long. These stingers have a serrate edge whose spines are recurved. It acts like a compound fish hook and is very hard to disengage.

We also caught a nice series of corbina, enough so we had 7 left for food fish. I saved a couple dozen squids also. We got back to camp about 12 midnight. Art and Andy went to bed at once. I cleaned the fish and Boyd filleted them. While he fried them I cleaned squids [drawing]. This should leave a piece of meat shaped like this [drawing]. Turn it over and pull off outer skin and fins. Then wash this, flour it, and cook in very hot fat (deep) for about 30 or 40 seconds—just until brown.

The corbina was the most delicious fish I have ever eaten. Boyd cuts the fish into pieces about 2 inches square, flours them, and fries them in hot deep fat until well brown but not dry. With salt it is really wonderful and made moreso because the fish had been out of water only about an hour or so.

The 3 of us ate 6 fish (good sized) and several squid. The squid had a delicate flavor all its own and is really wonderful.

When we finished it was about 2 AM and we went out to watch the gulf grunion on the beach (*Hubbsiella*). We saw a few flipping on the sand. At about 3 AM we hit the sack.

February 4, 1950

Bahia Kino, Sonora, Mexico

When we woke the camp was swarming with small Mexicans.* (*I set about buying turtle skulls for Chuck Shaw at he San Diego Zoo, who is studying the beasts. While I wrote notes on the running board—skulls kept coming in. I gave each smiling kid 25 centavos or 50 good ones. One kid kept appearing with a particularly good type of skull. Finally after 2 such returns I realized he was bringing me a skull so I paid him and put it in the bucket on the opposite side of the truck. I went around, sat in the sun and wrote notes, and the kid picked up the skull out of the bucket and brough it to me after an appropriate period of waiting. This profitless (for me) barter was stopped at once.) A pair were engaged in a hot ball game over Dave's still inert form.

He woke when a sizzling grounder buzzed by his ear. It is Sabado and there is no school today so we had company all day. They were nice kids well versed in the arts of begging. They extracted considerable food from us during the day. One, Manuel, a little kid of 9, was Dave's buddy. He had on the usual baggy kneed jeans, a denim shirt and a ragged coat (and of course, no shoes).

He could smile from ear to ear—showing teeth in all stages of growth and disappearance. He jumped in the boat at the last minute, leaving his amazed friends behind, when Dave, Art, and Andy went to seine the Estero south of town.

I remained in camp and later hiked about 5 miles over the dunes looking for *Uma*.

Later in the afternoon Art and Dave and I took the boat, through a choppy sea, to a rugged rocky island about ½ mile off shore. We collected a tide pool there—driving off a whole fleet of pelicans from the rocks as we landed.

At sunset we were treated to a real spectacle. Clouds turned brilliant rose red and the sky a dark blue—over the shimmering water it was a really beautiful sight.

Tomorrow we leave to go to La Libertad north of here. Preparations and dinner and notes occupied the evening.

February 5, 1950

24 miles W. of Santa Ana, Sonora, Mexico

Andy got us all up at some horrible cold hour (7:30 AM). We ate breakfast, packed, and said adios to our nino friends.

The drive back seemed shorter and was much less dusty (in the big truck). At Hermosillo we bought gas and drove out to a tributary of the Rio Sonora in an attempt to sample the fish fauna. We rode through some fields where Mexicans were plowing with a crude plow drawn by 2 motley horses. Shortly we came to a damp river bottom with a few shallow muddy pools. Boyd didn't like the looks of it so we left for Santa Ana. A couple of beers later after lunch we arrived at Santa Ana.

I would judge it is a town of 5,000 people. Boyd wanted to leave our collections somewhere in town so they would not be bounced around on the dirt road. Finally, after a short aimless drive Dave pulled up in front of a big white building with the Mexican flag flying in front. Art went over to ask directions and the first person he met spoke English and the second was the town mayor. He opened the building and told us to stack our cans in an office. Quite a stroke of luck. The building was the city hall.

We drove off towards Altai on a fairly good dirt road passing through hills covered with *Larrea* and mesquite. Just after sunset we crossed a muddy little creek. Andy turned off on a small dirt road along the creek. Camp was made on a flat dirt bank by the stream. The water flows in an arroyo about 8-10 ft. deep.

Willows, *Baccharis*, mesquite, and cottonwoods fill the river bottom. The banks are vertical and in some places eroded into small badland formation.

I was voted Ranch foreman because of my sterling accumulation of dirt and other sorts of grime. All my clothes are filthy and I have a dirty 3 week's old beard—so I guess I deserve the honor. The others are not far behind.

The day has been warm and partly cloudy with the air becoming quite cool in the evening. We all enjoyed a fine campfire and a good pot of stew. We will get up early and drive on to La Libertad, 125 miles away.

February 6, 1950

La Libertad, Sonora, Mexico

Andy got us all up before dawn (indigestion we decided). I am very unhappy about leaving my sleeping bag at such an hour and did so only under protest. It was cold and I was nine tenths asleep.

We pulled out and drove on down the main road to Altai. The road follows a phone line and shows vague signs of once having been graded.

Shortly Andy and I pulled into Altai. The town is a fairly small one with a big brick church, a square (plaza), and lots of palm trees. Some farming is done in the valley and water flowed in an irrigation ditch going through town.

After a rough drive through a mesquite-palo verde-ocotillo covered semi-desert the road crossed the railway, went up over a hill and dropped down into the cultivated little valley in which Pitiquito lies. The town is somewhat sloping. We all liked the town. It is rather neat for a Mexican town and the people were helpful and pleasant.

While trying to buy gas we met a ma named Diego Salceda. He took us over to a gas station he is constructing and got us 40 gallons of gas from a drum. He is an interesting person. His english was quite good and we learned a good many hngs from him. He plows for people with his big Fordson—50 pesos per hectare (2 ¼ acres). Diego

drove a yellow jeep (given to him by Pres. Aleman). He was a lover of engines and had 2 power plants and 2 or 3 tractors.

His wife cooked us 40 tortillas. She used wheat harina, lard, and salt. They were cooked on a butane range. We all enjoyed them.

At the local cantina we stopped in and bought a couple of rounds of beer. Diego got a half dozen Mexican calendars for Dave. These calendars are real works of art. One, we got from Guaymas, shows a scantily-clad girl clutching a long-stemmed sweet william in her teeth. Diego knew Van Rossen and had carried on some correspondence with him. Of course he was unhappy to hear of his death.

Diego bought some beer and cigarettes for 2 of his friends at La Libertad. Also he gave us a note to Bill Boswell asking this fellow to come up and try out an airfield he had just cleared.

We crossed a cottonwood lined wash, drove past some large cottonfields and entered a cholla desert. Some of these cacti were 7 feet tall. The road was dissected in many places by washes and the going was quite slow. The 2-rut road wound through small valleys and over low rocky ridges. Large saguaro cacti became more and more common as did the organ pipe cacti.

Just past Rancho Primavera we took a road cutting off to the right that cut north over a low ridge clothed with tall dense palo verde and mesquite. This road continued northwestward for several miles, past a small area of *Yucca mohavensis*.

Andy and I looked for *Xantusia* but found none. It seemed too dry. I believe *Xantusia* may occur here.

A little further on we came to a junction—one road leading to Caborca and the other to La Libertad. This road lead southwestward past Ravelo[?] Americano, through a gap between saw-tooth barren mountains and out onto a huge bajada back of La Libertad.

Just at sunset we saw the little village. Shortly we came to an airfield (with a small plane parked alongside). A small hotel (7 or 8 rooms) built on the land just back of the beach is situated at the end of the airfield. It is not in use now but is in good repair. A little ways back from the beach are 4 or 5 adobes, a well and some tents. We met Bill Boswell here. He is a young fellow from California. He was quite close-lipped but helpful. He is farming some sort of grass for seed. Supposedly he owns 38,000 acres (or some other fellow—I am not sure) here at La Libertad. He has 560 acres cleared and is working on 500 more. There is a 400 foot well said to pump 4 2 inch pumps at once. This information comes from an unreliable source. This same source tells of a new big hotel that will be built here. He (an ex navy man of some sort) tells of big deer taken out of this area—(straight stuff) a game preserve which extends from La Libertad to the north end Tiburon and back inland a considerable distance. Pres. Aleman, is however, allowed to hunt. (He told us moose and elk were common in the area.)

Bill showed us a camp spot where we could launch the boat. We ate dinner and seined the beach. The bay is a fine crescentic one limited by rocky headlands both on north and south.

In one of the seine hauls we brought in a fish which Art said was a numb fish. He said it would give a shock if picked up. I thought it was an angel shark and so I told Art he was nuts or words to that effect. I picked it up and played around with it to prove my point—whereupon I got a good shock—about like 110V. The fish was about 2 feet long.

February 7, 1950

La Libertad, Sonora, Mexico

Before I had time to dress Andy and Boyd shoved off for some rocks to look for tide pools. I went along minus my shoes—in my sweat pants. These pants are a bit disreputable now due to 3 weeks of dirt. We found some beautiful reefs but few pools. We could see the big groupers swimming away among the kelp.

By the time we returned with poison the wind had come up and we had a lot of trouble locating fish but a good collection was made including several *Lythripus* (a red a blue goby).

After lunch Boyd and Andy and I went out fishing. We caught a lot of fish—mostly small bass and grunts. Andy caught a nice pinta (grouper). At dark we returned and we went out again in the dark. There was no moon and we were given a beautiful show of phosphorescence.

The wash from the boat glowed with a bluish white light so bright that the entire boat was illuminated. The stern waves glowed for a long distance behind us.

2 fish and 3 hours later we returned. It had been so dark we couldn't find our rocky point. I tried a little surf fishing (there is virtually no surf) and hit the sack.

Note: Today Art was probing around in a tidepool and his pen dropped out into the water. A long snaky arm with suckers on it grabbed the pen and pulled it back under the rock. We think the octopus was out of ink and needed a refill. Art didn't get his pen back.

Later I was filleting a trigger fish. I had one fillet off and the other one nearly off when he bit me on the leg. They have quite a mouthful of teeth. This one raised quite a welt. The fish is not very tasty, however.

February 8, 1950

La Libertad, Sonora, Mexico

Just after our usual pancake breakfast we all went out to the rocks and poisoned along a reef. Andy caught the octopus that took Art's pen. He didn't have it. We kept him to cook.

A lot of the poison drifted out to sea and we picked up a good many fishEs from the boat using the outboard motor. Some tidepool poisoning!

Back at camp I cleaned and tried to skin the octopus. He was the slimiest beast I have run into yet. Finally I cooked just part of him. The flavor was O.K. but he was rather tough.

After this fiasco I went south to the edge of the bay. This deposit is roughly triangular. One side is a series of steep dunes along the seashore. These dunes reach a maximum of about 75 ft. The dunes drop sharply behind this line of beach dunes to a series of hummocks lying along the north bajada of a range of mountains that extend out into the gulf forming the southern headland of La Libertad Bay.

The dunes line the beach for about $\frac{3}{4}$ of a mile. In extent they probably cover 200+ acres.

I saw no *Uma* but did see tracks quite typical of the species. The sand is fine well sorted sand of a light peach color. Just north of this deposit is a small line of beach dunes that are obviously beach-derived. They are pure white and are separated from the main mass only by a small wash.

It seems probable that *Uma* is not yet out. I suspect that they occur here but have no real indication to back this view. After a very dusty drive I returned to camp and ate dinner, seined the bay, and hit the hay. We netted a big halibut (about 25 lbs.). I filleted him for Andy to cook in the morning. Boyd showed me how to cut out the cheek meat from a halibut. It is a little semi-circle of meat lying just anterior to the pre-opercle. The meat is esteemed by the fishermen who save it from their catches.

February 9, 1950

24 miles SW of Santa Ana, Sonora, Mexico

Another trip to the sand dunes showed that *Callisaurus* was making my *Uma* tracks.

Art and Dave and I returned, getting well powdered with dust. All of us quickly packed and left for Caborea. Before long we passed Americano Rancho. A little later we reached the junction and took the branch to Caborca. It proved to be highly dusty. Art, Dave, and I came out looking like we had dipped our heads in a talc barrel. The 2 in the power wagon (Boyd and Andy) didn't even get dusty. They had a big laugh at my expense.

The road was much faster travelling, even with the dust, than the other route. Shortly we passed a cotton field and then a couple of wheat fields. Then we could see the old ruined cathedral. "Cathedral Nuestra Senora de la Concepcion de Caborca" and the palm trees of the town. This cathedral is an ornate one with a fancy belltower and a big crumbling dome. It was built in 1694 by Spanish missionaries.

Caborca is a typical sprawling pueblo. Mexican music was being played in the plaza as we passed. We bought gas and drove toward Pitiquito. Just out of town we seined the Rio Magdalena.

We caught a lot of Poeciliids and minnows and a turtle that is probably *Kinosternon sonoriense*. The water was highly mineralized. The banks were white with salt. Water temperature was 24 degrees C.

After dark we drove through Pitiquito. Thewen as bigger than we thought. It was interesting at night with its unshaded 25 watt bulbs and dozens of straw-hatted Mexicans crouched on the curbs in the half light. A neon sign advertising Carta Blanca beer looked highly incongruous.

After a long drive and much singing we made camp in the same spot we had occupied on February 5.

February 10, 1950

Ogilby, California

Arose early and drove to Santa Ana (pronounced Sant-Ana). We picked up our fish cans and drove to the border. The inspectors gave us very little trouble—principally because of the immense amount of dust on everything. We drove till about 1:00 AM and camped on the bajada near Ogilby.

February 11, 1950

Van Nuys, Los Angeles County, California

We were all up before dawn with the mosquitoes. At Riverside Art and I seined the stream. We had the help of a couple of small boys. Dave phoned his wife and found that I had passed my Ph.D. qualifying exam.

I arrived home in the late afternoon, shocking my mom with my filth and newly cultured moustache.

The trip had covered about 2,100 miles and had been most successful.

March 12, 1950

Pushawalla Oasis, Riverside County, California

This morning I cleaned off the truck top, killing 4 black widows. A liberal spray of kerosene was used over the parts I couldn't inspect. Then I packed up the truck and left about 9:30 AM.

At Sunland I stopped and bought \$12 worth of food and then continued on my way. The day was quite overcast. By the time I reached Redlands the clouds had descended and a few drops of rain spattered the windshield.

The San Gorgonio pass was its usual windy self with wind whipping up clouds of dust and sand in the wash. At Cabezon I reached the edge of the clouds. Often I have seen them plugging the pass and stopping abruptly in the region of Cabezon or Snow Creek, with clear skies over the Coachella Valley.

In Palm Springs I stopped at the Standard station and changed the front wheel flanges so that the 4 wheel drive would be operative. It is always quite a job and I cursed and swore for half an hour before I succeeded.

Out along Ramon Rd. things are building up rapidly. The "desert outpost", a series of closely packed houses in the middle of the sand dunes, advertise "Enjoy real sport to the most at the desert outpost" and "Your friends will drool when they see your new pool". I'm glad I don't live there—the idea of having a lot of drooling friends around, messing up the [?], is too much for me.

3:30 PM. The wind had abated somewhat but the air was far too cool for lizards to be active. I drove on past Hidden Springs Ranchos, Golden Dawn Acres, Moon View Guest Ranch, past Shangri-la Palms, to the dirt road to 1,000 Palms

Driving south along the Powerline Road I passed 9 big power poles and drove about 100 yards further, to the road leading into Pushawalla. This road is somewhat south of a right angle line from the road to an airplane beacon out in the valley next to a ranch.

I drove slowly up the wash. Among the palms of the oasis I startled a bobcat. He loped off into the *Tamarix*. At the oasis I stopped and walked around looking for signs of Lamda Sigma, who was supposed to be at the oasis. A big covey of quail (gambels) shot from a nearby mesquite, startling me no little bit. No one was around so I made camp, cooked dinner and observed the toads (*Bufo punctatus*) and *Hyla regilla* in the small stream. The *Hyla* chorus has been deafening all evening (see species acct.). This oasis is a wonderful spot. It has no particular view as it is in a steep-walled canyon and is not quiet. The frogs, the palm fronds, and the birds see to that. But it is really a gem in this desolate area (and nowadays—built up area) where you are seldom bothered. The road in requires 4 wheel drive and is very hard to find. The wind is never bad in this oasis though it does blow in gusts—but compared to the valley it is calm.

March 13, 1950

Travertine Point, Imperial Co., California

A dull roaring noise pushed into my mind and roared for a while until I decided to wake up. I sat up, blinked, and saw a jeep, whose motor was racing, pulled up in back of mine. [Drawings] I got up and let them drive through. This is the first time I have had traffic problems in Pushawalla at 6:00 AM. After breakfast I drove slowly down the wash and out toward Indio. At the La Quinta cutoff from Hwy. 99 I turned left toward the Chuck-a-walla ranch. In the dunes there I caught an *Uma* by noting where the sand had slid down a dune face. He was just above the mark. This animal shows the trace of a side blotch I have noted before in *inornata*. The day is clear and calm but not very warm.

I drove on to Mecca, past the "beautiful Hotel Caravansery" to the All American Canal. Taking a road just to the west of the canal I drove to Dos Palmas Spring (see description) . . .

(Dos Palmas Springs, Riverside County, California)

The spring is situated on an alluvial fan that reaches down toward the Salton Sea but is blocked by a low range of hills resembling old lake beds. There are several seeps scattered over the fan and just back of these hills is a rather extensive area of reeds. There is a playa near these reeds. Some sand has accumulated along the slopes of the hills away from the Salton Sea.

The spring proper runs from 3 main places. The southern is a muddy area grown up with reeds and supporting 15 palms (*Washingtonia*). The water flows in a small stream and coalesces with spring no. 2. No. 2 has been cemented. A good flow rises from a deep hole and flows into a channel running to the ranch below. 2 palms grow here. The third is about 100 yards away and is in the midst of a dense mesquite-rush thicket. One palm grows there.

Poeciliids and *Cyprinodon* are in the first 2 springs. The third was not inspected. Water temp. 31.1 degrees C. vicinity)

. . . where I took a few individuals of a Poeciliid (*Gambusia*) and a Cyprinodontid fish. The water is much like that at Saratoga Springs. It is warm and highly mineralized. The whole alluvial fan of Salton Creek is dotted with various groups of palms and rushes, which mark the seeps and springs. A small flowing stream runs from 3 of these that constitute Dos Palmas Spring.

I drove on up the alluvial fan of Salton Creek, past a Navy Firing Range "No Trespassing Sign" to Clemen's Well. This well has plenty of evil looking water about 15 feet down which may be dipped up with a bucket (1 bullet hole) and a rope.

The road to the well cuts off the canal road a little north of the center of the Salton wash (the pass which leads to Chuckwalla Mts., Baumunk Mine, etc.). It is quite rocky for a while but becomes better as you near the large fill of Henry Kaiser's Railway. After passing around a rocky point and going under a big railroad bridge, the well is reached. There is no habitat suitable for *Uma* in this vicinity.

I drove back to Dos Palmas Spring and to a couple of other palm groups—on my way back to the Canal Road the car cut out and stopped dead.

I had no idea what was wrong at first—after ½ hour of resultless labor I walked up the road to a car parked along the canal. 2 men were fishing. They told me they would take me to Mecca when they finished fishing.

I walked back to the car and traced the trouble to the distributor. After scraping a few items the car started and I was on my way again. I thanked the fishermen and drove back to Mecca via a cutoff which hits the Niland Rd. 200 miles south of Desert beach resort, where it passes out under a railroad bridge.

I gassed the car and drove to Travertine Pt., made camp in a wash, built a fire, cooked dinner, and wrote letters and notes.

March 14, 1950

Coyote Well District, Imperial County, California

To the northeast of Coyote Well, in the “Nattie[?]” Navy Air Base is a range of hills covered with sand, probably derived from Carrizo Wash. These hills may be part of Superstition Mt.

The valley floor (wash bottom) west of Seely is dotted with sand hummocks topped by *Larrea* and mesquite. The wind direction, judging from sand grain size, is generally toward the east.

At Coyote Wells there is some sand, apparently accumulated by water seeps. It is heavily vegetated and of coarse size.

½ mi. S of Seely, Imperial Co., California

I got up fairly early, cooked a breakfast of pancakes and bacon and took off down the road. At Sandy Beach I drove east of the road and investigated a series of disjunct barchane dunes. A variable wind direction has apparently caused the barchanes to flatten out on the points [drawing]. I caught a big male by digging in the drop face of the dunes. I could see the bury mark where the animal went in. He was just above the surface mark.

After getting slightly stuck I drove on down to El Centro and out toward Superstition Mts. On their west and south slope considerable sand has accumulated. I was unable to reach this locality because it is a navy firing and bombing range being used by jet planes. I drove on up to Coyote Well and down to Mount Signal. The road is a good graded affair that reaches pavement at Mt. Signal.

I met Art at El Centro after getting all dressed up and shaved. To my surprise Art was shaved too. We ate dinner and played a few games of pool—then drove out to Seeley and hit the sack.

March 15, 1950

North End of Laguna Salada, Baja California, Mexico

Art and I arose somewhat the worse for wear (we both have colds) and drank a little orange juice and drove into Calexico to meet Dr. Hubbs et al.

We met a Mr. Walter Bowker, who is nominally in charge of the Mexican division and is actually in charge of the Calexico Office of the Imperial Irrigation District. He knew the country very well and has many contacts. He referred us to Johnny Alvaraz of the “Leon de Ono” in Mexicali. This gentleman runs a guide service along with his restaurant and bar. We did not meet him.

We left Mr. Bowker. I took Dr. Hubbs to the airport where he flew off to go over the Laguna and the lower Colorado on reconnaissance. Art, Al Allanson, and I drove out took for Pozo Tule at the north end of Laguna Salada. We drove the roads until night and never did find the spring. We made camp among some tamarisks at the north end of the playa. The wind was blowing like mad and Art and I both have dismal colds. I was glad to hit the sack. Doc Hubbs and Bob Miller (Michigan) and Howard Winn (grad student Michigan) came in just in time for dinner.

March 15[16?], 1950

Guadalupe Canyon, Baja California, Mexico

Things look brighter this morning though I still have the cold. The laguna is really an amazing valley. The Sierra Juarez drops from a high crest to the valley floor in a steep scarp. The crest is extremely rugged and lined with pinnacles. A ring of dunes lines the huge playa (40 miles or so in length) on the west. The Sierra Cocopah is a desolate range rising to the east of the playa in an equally steep scarp. The playa has been dry for several (16) years now. It has filled up many times in the past by a combination of high tides in the gulf and high water in the Colorado.

I drove into town to get gas while the others went to Pozo Tule (which we had found directions to from a woodcutter). When I returned the cars were driving off across the playa. I caught them a few miles out and we drove about 25 miles down the playa to Pozo Demara. This Pozo is a well dug in the edge of the playa among big mesquites. There is a small dilapidated casa, a corral, and a pump, and the water is cold and clear. I estimate it at about 10 ft. deep.

We drove up through the dunes about or 4 miles to a junction of the road. The road to the canyon goes up this road for a while and then branches off to the left along the base of a spur among palo verdes and ironwoods. It rapidly becomes worse and worse and finally becomes a jumble of boulders.

We stopped and hiked up to the palms in the canyon above. The canyon is a beautiful one filled with palms and cottonwoods with a nice small clear cool stream flowing down the boulder choked canyon.

A pinnacle called Virgin de Guadalupe was the butt of many jokes, particularly by Dr. Hubbs, who seems to be fascinated by the rock.

We all walked up to a big falls. The water flows over a cliff into a nice deep pool (8-9 ft.). Since the day was quite hot the water was too much of a temptation so we all went in swimming.

I collected lizards and returned to the car at dusk. The others had done likewise and we drove to a place lower in canyon and made camp. Dr. Hubbs regaled us all with stories of his fabulous doings, chiefly various airplane rides he has taken. He also told us about Dr. David Starr Jordan when Hubbs was one of his students. We hit the sack shortly and just as shortly thereafter my air mattress collapsed—so I slept on stones all night and I didn't mind it much.

March 16, 1950

Pozo Tule (synonymous with Pozo Loreto), Laguna Salada, Baja California, Mexico

The good doctor was up wheezing on the fire just as the first streaks of dawn could be seen over the Cocopahs. Of course he bellowed until all of us were irrevocably awake—so I got up at dawn, which is not my custom. On this day Dr. Hubbs planned to explore Tajo Canyon, a deep gorge just north of Guadalupe Canyon. There is a small group of palms in between known as Carrizo Palms but there is no extensive canyon.

Since I wished to collect some *umas* for my forthcoming epic I did not go with them but drove toward Demara's well and along the west side of Laguna Salada Playa. 3 times I hiked back into the dunes, hunting *Uma*. I saw them, but they were extremely wary. I was able to shoot only 1 small juvenile (see notes).

The day had grown quite warm and the hiking had worn me down some so I drove to the north end of the playa and backtracked to Pozo Tule. The road to this well cuts off to the right (west) about 100 yards out on the playa from the north end and swings over to the west edge of the playa to a group of *Tamarisk* trees surrounding the various springs of the pozo. I guess the springs are about 1 mile south of the north end of the playa along its west edge. There is a small cabin in one bunch of tamarisks which I have not investigated. 2 (3) pools are about 6 ft. across and the others are small seeps. 1 of the large ones has been boarded up and contains clear fresh water. At one time there were Cyprinodont fish in one of the pools but they are gone now.

The salt pool is known as Pozo Salado and is the other big pool I believe.

I hiked in the dunes back of the springs, finding a few shards of Indian pottery among the dunes. Yesterday I found the upper half of a big olla sitting among the rocks of a spur at the mouth of Guadalupe Canyon. Al Allanson has found several stone implements and a lot of pottery sherds.

After locating the springs I drove up the north bajada of the valley to a long longitudinal dune that has accumulated to the east of a large spur. *Uma* was common but very wary. The animals would run when I was 100 yards away. I was hot and climbing the face of the big dune (100 ft.) really wore me down so I sat in the shade offered by a big green *Ephedra* (mormon tea) bush and panted a bit. Finally I began digging around the bases of bushes growing in the slope and quickly caught 4 *umas*.

I then drove to another dune where I did some half hearted collecting and then drove back over the long bajada to the playa and out to the pozo. One more short hike yielded some more pottery pieces, a cylindrical grinding stone, and 1 small *Uma*.

I then started to make camp just as the sun was setting over the Sierra Juarez. I gathered a lot of ocotillo wood and 1 precious piece of mesquite, built a fire, laid out my sleeping bag, and cooked a huge dinner of 1 full package of Minute Rice, 1 can of string beans, a can of boned chicken, a can of fruit salad, and coffee. This array only makes me feel comfortably full at present.

The rest of the evening will be spent writing species accounts and tagging specimens. So far the night is calm and clear. I expect the others either later tonight or tomorrow morning at some ungodly hour.

Laguna Salada, Baja California, Mexico

The extensive dunes to the west of this basin (see Crosby American Geog. Soc., 1929) are all occupied by *Uma notata notata*. The one adult animal (female) I captured had the characteristic latero-ventral red stripe.

The dunes at the edge of the playa are white in color. The sand is rather poorly sorted and in places contains much mica. The westward surfaces of the dunes are often of much coarser material than the east slopes (sometimes of larger grain size than that usually acceptable to *Uma*). This indicates a wind source from the west.

The dunes, quite obviously, have been formed in situ by water sorting (possibly, probably) beach action when the Laguna has been filled. It seems probably also that it was constantly full during the Pleistocene pluvial periods considering the level of the southern entrance. The source of alluvium is the Sierra Juarez.

On the northern bajada there is a localised deposit of wind sorted and transported sand. It is a light peach color and is much better sorted than the dunes around the playa. Small hummocks of sand, often held in place by mesquite or *Larrea* cover most of the eastern slope of the bajada.

Against the east face of a north-south spur which extends out to the bajada, a long longitudinal dune (very moist sand was reached about 1 foot down) has accumulated. It is possibly 80 ft. high at the spur and tapers off in about 175 yards. The *Uma* found here are definitely of a redder shade than the white animals occurring on the beach dunes.

Along the east side of the playa there is less sand than elsewhere. About 3 miles from the north end of the playa a limited area of sand blown up on both sides of the 2 or 3 spurs of the Sierra Cocopah may be seen. I could not see other localities.

March 17, 1950

¼ mile S. of El Mayor, Baja California, Mexico

I dreamt Dr. Hubbs was standing over my sleeping bag yelling over and over again his usual "Vamanos, vamanos, vamanos". I opened my eyes and realised that a family of coyotes were yelping about 40 yards from my bag.

I got up, tagged my specimens, ate breakfast, cleaned up camp, and waited for my friends to arrive. They finally showed up at 9:30 AM after I had gotten up at dawn (with the coyotes' aid).

When they arrived we seined all the larger pools but got no fish. Fish were taken in 2 of the pools in 1941 (*Gambusia* and *Cyprinodon*). We then drove around the head of the playa and down 12.8 miles to Pozo Salado, a hot spring which runs out from many small seeps near the fault line at the base of the first longitudinal ridge of the Cocopahs. Nowhere was the water much over 6 inches deep. The hottest water temperature was about 109 degrees C.

Back in the cool water along the edge of the stream and among the muck—even at the bottom of the stream—the temperatures were much lower, even as low as 81.5 degrees C. We found no fish. After lunch we drove on back to the Cantu-Mexicali Rd. and into town. We all went into a cantina and had a Mexicali Cerveza which was highly appreciated by all hands. Dr. Hubbs and Dr. Miller drove out to see Manuel Demara while the rest of us drove on down across the plain to El Mayor. This place consists of a couple of houses and a boat dock at the base of Cerro Mayor, along the Hardy River, which swings over, close to the base of the mountains. We made camp in a boulder strewn wash.

Dinner was concocted by Art and contained numerous mystery ingredients such as bean sprouts, jalapenos (chiles), meat balls, potatoes, etc. It was delicious! Drs. Hubbs and Miller returned and told us they had engaged Manuel Demara to guide us to a

hot spring containing fish on the east side of Laguna Salada. I will drive the 2 doctors and Manuel in on Monday.

During the return trip the 2 Doctors ran into a mound of road topping piled along the road center. They were going 47 mph at the time. The car stopped in 55 feet and luckily did not turn over.

To the sack—tomorrow I go to San Felipe.

March 18, 1950

¼ mile S. of San Felipe, Baja California, Mexico

I got up early, ate breakfast prepared (in masterly fashion) by Al, and left for San Felipe. The road passed along the base of the Sierra Cocopah and Sierra Pintada. The Rio Hardy passes close to the road most of the way and then passes out onto the flat. The mountains are dissected, rugged fault block peaks running in a north-south direction. At about the southern entrance to Laguna Salada the pavement ends. The road crosses the entrance on a high filled embankment that blocks the entrance. Just on the south side of the opening (which is a rugged playa-type material without vegetation) are a large series of dunes trapped in a V shaped gap. I collected here by digging around the bases of bushes. As it was early morning the animals were lethargic and I caught 4 with little trouble. Beyond these dunes the road passes through a series of low hills of volcanic origin. Shortly it became rougher and before long was a venomous washboard which was continuous to San Felipe.

A lone volcanic caldera was passed to the left of the road, with a little patch of wind-blown sand on its north face. The road passed along a broad, nearly level bajada which originates from a series of rugged north-south foothills of the Sierra San Pedro Martir. I could see the great granite peak of La Providencia (La Encantada or Picacho del Diablo), which is the highest summit of S.S.P. Martir—about 10,000 ft. or so.

Shortly Punta Estrella came into view. It is a volcanic peak which rises from the bajada and drops into the gulf just north of San Felipe. On its northern edge, along the beach is a small collection of pink sand. I drove over as close to the dunes as I could.

3 large arroyos blocked my passage. The spring had hit this area. A small *Oenothera* and *Abronia* were blooming as was the ocotillo.

I searched the dunes and collected some *Callisaurus* and tracked a sidewinder down, finding him enmeshed in a dense bush. *Dipsosaurus* was common in the mesquites and larreas of the arroyo bottoms. No *Uma* was seen and I feel sure it does not occur here.

After leaving these dunes I proceeded into San Felipe along the old road, which is much better here than the new one.

San Felipe is a little town of perhaps 500 people built on the slopes of Punta Estrella and along a big barrier beach dune. The bay is a beautiful crescentic one limited on both south and north by rocky headlands. A single beach dune lines the edge of most of the bay. It reaches its largest size at the southern [?].

Perhaps 2 dozen fishing boats of various sorts were anchored in the shelter of Punta Estrella. This is Totuava[?] season and these are part of the fishing fleet. Every house is surrounded by large mesh gill nets, drying on ocotillo poles stuck in the ground in rows.

I stopped at the Customs and inquired about roads to the south to a big area of trees I could see. The officer was puzzled and suspicious of me—principally I believe because the trees I saw turned out to be the shadows of a cliff. I found a road passing out of town across the small airport and back of the beach dunes. The road passes through pile after pile of Totuava heads and then out into the *Larrea* scrub.

I investigated the beach dunes and shot a number of *Callisaurus* and left for El Mayor. It seems obvious that *Uma* goes no further south than Laguna Salada.

It was after dark when I pulled into camp and found the others about ready to cook dinner. Dinner was eaten and I found that the rest of the crew had visited Tres Pozas (at south end of Laguna Salada). Near here they had found an Indian cremation site. Once in bed I slept like a rock.

March 19, 1950

Jaspar Dunes, near NW Bond's Corners, Imperial Co., California

We got a late start this morning. I had time to fix the truck top a little and clean the back before we left. Howard and I stopped in a couple of places to hunt. We collected a fine series of *Cnemidophorus* from 3 localities. I was told by a Mexican fellow that *Uta* was "muy veneno" (very poisonous). We then drove into Calexico and watched the Cavaleade which was progressing full blast. We saw a big parade including a lot of horses and silver saddles and old [?] and fat ladies on horses. When the "Saddle Pals" rode by, Dr. Hubbs said in a loud voice "Oh, the straddle pals"—much to everyone's surprise and chagrin (a little maybe).

After the parade we drove to Bond's Corners and the Alamo River. Doctor Hubbs decided it was too full of snags to seine so we drove on up the river (north). After deciding that we couldn't seine there either I asked the Doc if we could all go across the river and look for *Uma* in the dunes. This we did and caught about 10 animals. On one Al chased an animal furiously and stopped with his feet about 3 inches from the edge of a 20 ft. cliff along the bank of the Alamo. We went back to Bond's Corners and got food and gas. On the way back to the dunes (to camp) Art and Al got lost and went clear to Holtville. We all camped about 200 yards back of a negroe's house in the edge of the dunes. Dr. Hubbs brought in a gecko and Art, Louis, and I caught 2 more and a sidewinder. Al skinned the snake and we all hit the hay.

March 20, 1950

Ogilby Wash, Imperial County, California

Dr. Hubbs, Dr. Miller, Louis Gusman, and I left camp early and crossed the border to pick up Manuel Demara, who was to guide us to a hot spring in Laguna Salada.

We found him crouched down by the wall of his house, hat pulled over his eyes, covered with flies. He is a little Mexican with an unkempt handlebar mustache and a dark brown much wrinkled face. His pants were patched in many places and some of the patches had patches.

He was 79 years old and sufering from rheumatism. We finally convinced him to go after telling him we could return before dark. We drove off, after waiting for Manuel to eat his breakfast.

The paso-inferior was very dim and we decided not to attempt it.

Manuel described the flood of 1905-1906 when he piled his wife on a raft just out of Mexicali and pushed and paddled it clear over to Cerro Prieto. He told us that the Cocopah Indians were unfriendly when he first entered the valley. He said it was unsafe to travel alone. The spring he lead us to was one we had seen before and had no fish. Apparently this spring (Pozo Salado), which originates from the west Sierra Cocopah fault, has been altered and no longer arises from the same point. The fish, reported by MacDougall, are now gone. The spring is now cooler (109 degrees F.) than before (127 degrees F.) when MacDougall saw it.

Manuel let me photograph him after asking 100 pesos, at first. He is a sly old chap but is very flighty. He flew into 2 rages while riding with us. One, because we asked too many questions and he said he thought it was not good to give out so much information (for the good of his country). The second time he was mad because we did not inspect the spring he brought us to. On the way out we had a flat tire from a stick which rammed between the treads. After taking Manuel home we drove out to Ogilby and made camp by some big mesquites. The other cars, which had gone to the Salton Sea, were not there and they had most of our utensils. Dr. Hubbs tried cooking over a huge open fire. The pork chops cooked in about 1 minute in their own flames. In a similar disjointed manner we cooked coffee and vegetables. A cherry pie finished the proceedings.

I hit the sack about 11:15 PM after writing these notes.

March 21, 1950

15 mi. S. of San Luis, Sonora, Mexico

After breakfast and packing I left the main party and drove west to the Algodones dunes at Hwy. 80, along the All American Canal. By driving up and down the road Keith and I had gotten stuck on (resurfaced) I caught a fine series of *Uma*. I stopped in at Sand Maintenance Station for a drink and then drove to Winterhaven. There I got gas and oil from my Shell dealer friend and continued on across the border.

As I crossed the Colorado I could see a group of men in boots in the river. Closer inspection showed them to be Bob Miller, Art Fleshsig, Louis Gusman, and Howard Winn.

I dropped down to the river on a dirt road and we ate lunch together. I went out and got beer for the crew and we had a good chow-session.

Then I drove along the bluff east of Sommerton and Gadsen. There were some dunes of white sand, both along the bluff and scattered between farmer's fields. I found no *Uma*.

I took a 15 minute siesta under a big cottonwood and continued on to San Luis. The Mexican customs official was busy at a fiesta so I had to go find him. The fiesta was in honor of the owner of the "Club International" who was having a birthday. I was given a tortilla and meat and a Carta Blanca beer—a fine way to cross the border. I showed the gentleman (a Sr. Fernandez) my papers and he somehow got the idea I was Dr. Hubbs, Director of Scripps Institute, so all was very rosy. Another fellow showed me the El Golfo Road and then asked for 2 dollars, which I did not have. I had a ten and did not part with any of it. I do not like to pay for receiving such courtesies.

The road to El Golfo cuts diagonally across the airfield and out across a very flat monotonous *Larrea-Franseria* plain. At 4 miles the road begins to get sandy and by 15 it is almost impassable. None but a big truck or a 4 wheel drive car could go further.

As it was sundown I camped and cooked a scanty meal. The place is about the most lovely campsite I have used. Only the Alvord Mts. was worse. I tagged specimens and hit the sack.

March 22, 1950

2 miles East of Imperial Dam, Arizona

I got up at dawn and started back. Shortly I picked up an *Uma*. I was *U. n. cowlesi* and an extension of range of 100 miles or so.

Back in San Luis I had no trouble crossing and drove with a Mexican fellow to Yuma. I then drove up on the mesa at the western foot of the Gila Mts. Finally after a considerable search I took a big female *Uma*. Then I caught 4 more specimens. As I had suspected it was *U. n. cowlesi* also. More collecting in this general vicinity and I headed for our rendezvous point on the road to Imperial Dam.

By taking the road to Quartzite I came to a road to the left labelled U.S. Army Engineers Testing. This road is paved and cuts off of the Quartzite before the pavement ends. The road leads to Imperial Dam and a rather extensive group of USAE buildings.

I made camp about 3 miles down the road under a big ironwood tree. I prepared cocoa for the crew and cooked my dinner. They have not arrived as yet and it is about 9:00 PM. I do not expect them tonight.

Just as I had gone to bed a sedan drove up on the road and stopped. It was Dr. Hubbs, Phil Douglas (Fish & Game), and Art Fleischig. They were camped at Laguna Dam on the sand spit.

Finally, after considerable hemming and hawing I packed up, left my fine camp and pile of wood and drove across the river at Imperial Dam and down to Laguna Dam. A short hike down the sand spit produced 1 worm snake and a striped ground snake. The animals were not out. They were both found under rocks in moist ground.

Once more I went to bed.

March 22, 1950

Sand location, South of San Luis, Sonora, Mexico

4 miles south of San Luis on El Golfo Rd. the broad level plain becomes sandier. The bases of bushes hold small hummocks—at no place does the sand accumulate in great piles. At 15 miles south the sand has become deeper but still is only small hummocks (2 ft. high). *Uma* presumably occurs from 4 miles south of San Luis to the gulf. It is definitely *Uma n. cowlesi*. Plants are *Ephedra* and *Larrea* principally.

March 23, 1950

Van Nuys, Los Angeles Co., California

This morning I woke feeling really lousy. I decided to head for home rather than spend any more time on the desert.

Before long I was really sick and by the time I could get across the sluice gates (welders were blocking my way) I knew the drive home was going to be a real ordeal.

At the Algodones cut-off I stopped to get air in the tires and the woman in the station was very nasty. She wanted to know why I was getting air when I didn't buy any gas. Then she said she would turn the pressure on but instead went inside and sat down. I drove off and got air at Gordon's Well. By Niland I felt a little better and forced myself to eat some ice cream. I took naps about every 20 miles. The road at the east side of the Salton Sea was being repaired and I was greeted by a sign saying "Detour next 20 miles—97 bridges out." In my condition this pleased me no little bit.

I finally arrived home about 7:30 PM and very quickly went to bed.

April 23, 1950

Sweetwater Spring, Ord Mountains, San Bernardino County, California

Dick Zweifel came over to the house about 8:00 AM. I was still asleep after Neal Harper's wedding party and a secondary party which lasted until about 5. I got up (reluctantly) and helped pack. Bill Reeder showed up a little later and we left in the University jeep.

We drove out through Soledad Canyon under a high fog. By the time we reached Vicente the skies had cleared. The weather was clear, fairly cool, and windy.

We drove out to Peck's Butte (Piute Butte) and hiked over the sand hummocks on its northern side. It is all part of a dude ranch—the Golden Mesa Ranch—and is completely fenced.

We hiked over a considerable part of the "dune area" and saw no *Uma*. We saw *Cnemidophorus* and *Uta*, but only a few of these.

Next we drove to Wilsona Butte. The air was warm, the day was sunny, it was about noon, and everything looked perfect for *Uma* but we found none and no tracks. I am quite sure they do not occur on this butte any longer.

Along the east edge of the butte a large tract of land has been cleared and is for sale for homesites.

At El Mirage Dry Lake we hiked over a few rocky spurs and areas of gravelly sand covered with *Atriplex* and *Larrea*. We took a few *Callisaurus* and a *Dipsosaurus* (Dick). This latter animal has never been reported west of Victorville in the literature. We saw another individual. Both were juveniles.

On our way back to the road (which has just been fully paved from Adelanto to Palmdale) we came across the tracks of a desert tortoise. Dick quickly spotted the old fellow sitting in the sun. His body temperature was 34.5 degrees C. AT 27-28 degrees C., soil 46.8 degrees C. His concave plastron and abdominal prongs showed him to be a male. I was surprised to note how short his tail was. Considering the mating posture of the animals it is difficult to see how intromission is achieved. We left him to wander and drove to the road, continued on to Adelanto, and ate our lunch.

After a brief stop in Victorville we drove on to Barstow. I slept most of the way. Then we continued on to Daggett and turned left across from the Agriculture Inspections Station on a good graded road that ascends the alluvial fan to the Ord Mountains? The sparse lowland vegetation was soon left behind and we came into a denser vegetation of *Larrea*, *Yucca mohavensis*, *Ephedra*, *Atriplex*, etc. There were some annuals in bloom.

The road passed into a twisting open canyon and shortly we could see Ord Mt.? (6, 3-0') elev., from whose canyons flow (drip) Aztec Spring and Sweetwater Spring.

At Aztec Spring a ranch with 3 or 4 buildings is located. We thought this ranch was at Sweetwater Spring and were almost ready to turn around but decided to go "over the next ridge"—which we did—and saw the U.S. Geol. Survey sign pointing to "Sweetwater Springs". We drove up a reasonably poor unused rocky road to the spring. We were greeted with 3 buildings, 2 of which are in good repair for the most part. A long building contained 4 or 5 rooms, a stove, and 3 sets of bed springs.

The camp is set in the confluence of several rocky, steep, open canyons, tumbling down the slopes of Ord Mt. The mountain is volcanic for the most part, though the effects of secondary mineralization are apparent.

Amygdules are common in the vesicular lava. There seems to be a vein of calcite at Sweetwater Spring. This spring is located about 150 yards back of the camp buildings (mine buildings) and is dug into the rock and covered over with a wood box and tin lid. The water is piped to a tank back of the main building. *Bromus*, *Acacia gregii*, *Ephedra*, *Lycium*, *Sphaeralcea*, and annuals such as *Phacelia* were fairly numerous.

At the spring we took a *Sceloporus occidentalis* which is rather remarkable considering the arid desert conditions surrounding this area. It is another relic distribution from pluvial times in the Pleistocene. The camp is situated at an elevation of 4,319 ft. (car altimeter).

We cooked dinner and fixed up the bed springs and wrote notes. Dick and Bill worked on insects. I am now hitting the sack.

April 24, 1950

Iron Mts., San Bernardino County, California

After a first class sleep we got up. Dick and I worked on breakfast while Bill went out to pick up his traps.

After breakfast Dick hiked up the large left hand canyon while Bill and I looked in a mine shaft for bats. We didn't find any so we started the jeep and drove up toward Dick. We looked in another shaft. They are (were) mining a complex copper ore with lots of barite. We could see veins of the stuff in the tunnel—still no bats. The lower tunnel is dry and the upper is wet.

Up the canyon, which is a jumble of boulders, we could see a pocket of cottonwoods growing in a portion of the streambed where it cataracts in a series of steps down the mountainside.

This is Sweetwater Spring in all probability and not the small dug flow near camp. The moisture extended down the streambed for about 100 ft. There were a few small pools of clear good water. The desert vegetation grows down both sides of the canyon and mingles with the moisture loving flora growing around the spring. *Yucca mohavensis* was growing alongside cottonwood trees.

Among the plants noted at the spring were *Artemisia vulgaris*, miner's lettuce, cottonwoods, *Rula*?, *Larrea*, *Yucca mohavensis*, *Salix* sp., and several annuals growing in the water.

Sceloporus occidentalis was common close to the spring. It was taken 150 yards up and down the creek bed, above and below the spring. These lizards did not go too far up the canyon walls but seemed to prefer the walls near the bottom. The animals are very black; much more so than any coastal *S. occidentalis* I have noted, except possibly those near Cajon pass on the Mohave desert.

Their gular patch and latero-ventral blotches were either a beautiful shiny azure blue or emerald green. Individual animals could make this change. Males had a nearly black back with a line of dark green scales. The mid ventral area is slaty black on males.

After taking plant samples and a good series of *Sceloporus* we hiked to the car and drove down the canyon, taking 5 collared lizards on the way.

At Daggett we drove east on the Needles road and turned off northward on the powerline road to a group of dunes along the edge of the Mojave River (south of Yarmo). These dunes are composed of fine white sand vegetated chiefly by mesquite, though there is some *Baccharis* and *Populus* on the dunes. *Uma* was taken here. It is interesting as it does not match the white sand but is pinkish. These dunes are contiguous with the Newberry dunes which are pinkish away from the river. These latter dunes form the main mass and thus probably determine the selections for this area of non-isolated animals. This is interesting as the only possible explanation demands that the color be genetically and not individually controlled.

We ate lunch and left, driving toward Amboy. At Ludlow we bought gas. I could see some rather considerable blowups of sand on a southern face of the Bristol Mts., along the southeast side of the Broadwell Valley.

Passing Lavi Dry Lake we thought we could see sand on the northwest and southeast corners of the playa. On the northeast the playa nearly contacts some extreme flows from Pisgah Craters. Much sand has been trapped by the ridges of lava and *Uma* was taken here along with some *Uta*, who were very black. They lived on the black lava. The umas were light and lived on the light-colored sand.

At the alkali flat southwest of Amboy we could see what might be sand along the southern edge. As at Pisgah, sand has accumulated on the lava floor around Amboy crater.

We drove through Amboy to Chambless and cut south on a good graded road along the east side of Bristol and Cadiz dry lakes. The low mountain ridge that separates these 2 playas is covered with sand on both slopes.

By the time we had reached McCoy Siding we could see a high ridge of sand hills circling the north and east of Cadiz playa [drawing].

We drove down a road which took us close to the sand, 4.2 miles south of Archer siding. This road is quite sandy and dissected by washes.

We took several umas. Tracks were very numerous. *Larrea* forms almost the only vegetation of the dunes. I think this sand area is probably the most extensive on the Mohave Desert. The dunes are of the interlocking-burchane type. I suspect they get 80+ feet high in places. The sand is a very light peach color, as are the umas.

We drove on down to Chubbuck. I looked for marks of old drainages but the whole area is smoothly alluviated. The valley slopes fairly rapidly to the southeast into Danby Playa. Only a very thin veneer of sand could be noted south of the playa.

We drove across the playa at dusk. Near its southern edge it drops about 10+ feet for a distance of 200-300+ ft. It looks like secondary erosion of the old playa surface and may be pluvial.

We drove up the south alluvial slope of the playa to the base of the Iron Mts. and made camp in a sandy wash filled with ironwoods.

April 25, 1950

Warner Camp, Granite Mts., San Bernardino Co., California

We got up this morning and drove to the Rice Hwy. And eastward to Rice. Before reaching Rice, along the southeast end of Danby Lake and extending south across the road and up on an isolated peak were a series of sand hummocks which probably form the accumulations from which most of the specimens marked Rice have come.

About 4.8 miles east of Rice we turned south on an old dirt road. This road was very poor as it cut at right angles across the drainages from the Riverside Mts. to the east.

We jounced along for 8+ miles on this lousy road and reached the dunes at Rice, where they are noted on the map. They are a snare and a delusion. The sand is collected just south of the bottom of the drainage channel in a thin sheet. The low dunes sometimes reach 8-10 ft. in depth. Palo verde and ironwood form the chief trees. They are very lush, indicating water . . .

Dormer Camp, Granite Mts. San Bernardino, California

. . . close to the surface. *Dicoria* is common on the sand in shallower situations. Peripherally *Erigonum inflatum* is exceptionally abundant.

There are 2 patches of sand each approximately $\frac{3}{4}$ mile in length and $\frac{1}{4}$ mile wide at widest.

The northeast terminal spurs of the Big Maria Mts. are covered nearly to the summit with sand which looks consolidated. The east slope of these spurs support some fair dunes (very restricted).

We found a nest of a red-tailed hawk in the top of a dead palo verde tree. I climbed the tree, which was nearly rotten, with 2 cameras, lenses, and light meters. There were 3 large downy young standing on the nest. I took several pictures and descended, pleased that the mother who was flying around, hadn't objected violently.

This valley apparently drains nearly directly into the Colorado. There may be a slight barrier to the groundwater as indicated by the verdant trees.

We didn't return by the old road but [?] toward the Vidal Rd. between Riverside and Big Maria Mts. Once we got in a wash driving was easy.

At Vidal we ate lunch and then drove to Needles. Then we continued to the cut off above Saltus and drove to the Granite Mts. and Dormer Camp.

Dick and I took some *Bufo punctatus* in the dry stream by camp. There is no water until the willows are reached, 150 yards above camp. There was no calling.

April 26, 1950

Pachalka Spring, Clark Mt., San Bernardino Co., California

We got up and Dick and I hiked up the valley to a couple of streams issuing from the south face of the Granite Mts. One, just west of Cottonwood Springs had considerable standing water in it. There were small *Bufo punctatus* tadpoles. At the extreme west end of the valley we inspected a row of cottonwoods lining a dry stream course.

Back at camp we put up specimens and packed. The *Bufo punctatus* we had caught last night were all paralysed from being bitten by a (2) longhorn beetle (actually a species of tiger beetle), which had been put in the jar with them. 4 specimens died and the largest one is still alive (1 day later), but is paralysed (he can move his gular pouch and eyes). The toxin must be very potent.

We left and drove to the Kelso Dunes, where we dug out 2 umas from a *Dipodomys* burrow. We drove through Kelso and to Cima where we bought lunch (beer and crackers) and continued on into Ivanpah Valley. Just before reaching Cima we saw an old desert tortoise walking along the road at 3:00 PM. BT 33.6, ST 30.8, AT 29.6.

We drove through Ivanpah Valley. There are no sand deposits in the valley.

Then we drove to Laire Ranch and Valley Wells. Taking a road going northeast here, we cut off to the east on a 2-rut road 1 mile past the ranch. This lead up on a broad alluvial fan to the base of Clark Mt. It cuts down into a deep wash and up the other side and over a steep spur to Pachalka Spring. This spring issues from a limestone formation at 4,800 ft. on the west side of the mountain. There are willows, elderberry, peach, and apple trees. The soil was moist from the spring down the canyon about 150 ft. Several other seeps occur nearby. There are 2 buildings in good condition near the spring. The vegetation surrounding the spring is low scrub and quite sparse. There are some cat's claw nearby.

I collected *Eumeces g. ubriadatus*[?] and we got some *Xantusia vigilis*.

Notes and the sack for tomorrow we hike to the top.

April 27, 1950

Fairbanks Ranch, Nye County, Nevada

We got up early, drank a cup of grapefruit juice, ate a candy bar and left on our hike up Clark Mt. We had a pack sack and our guns.

The "trail" pitched up rapidly. We followed the ridge and after a while reached the crest above camp. The vegetation was a xeric mixture of *Yucca mohavensis*, *Ephedra*, etc. An interesting little *Agave* with white, fringed leaves is common.

At the top of the spur we stopped for breath (about the 10th time). Far off down the road Bill noted the glint of sun on a windshield. The car was coming to Pachalka Spring and all our equipment was spread out, including Dick's watch and camera. Dick decided to go back. Bill and I continued on up the mountain, shortly entering the pinon belt. The wind was blowing violently but it was not cold.

The mountain slopes are mostly limestone which has been eroded into rugged knife-edge ridges. This made following the ridge a hard task.

I caught a nice big *Coluber taeniatus*, lying in the sun on the ridge. Catching this "New Mexican" form made me realise how similar this area was to the Sierra Oscuro in New Mexico. The only striking difference is the much more rugged character of Clark Mt.

We hiked on for a considerable time. Bill caught an *Uta* with no side blotch, which I called *Sceloporus graciosus* until I got back to camp. I was all excited over him. He was taken at approx. 6,500 ft.

Finally we climbed over a pile of limestone blocks, past a spur and saw fir trees (*Abies concolor*) scattered up and down a steep north canyon. We hiked over to them and shucked our pack and began looking for animals.

The situation is a steep north facing canyon choked with chunks of limestone. Pinons and junipers cover the higher slopes and the more exposed ones and are mixed in with the firs in the canyon. Downed logs of all 3 trees are common. There is considerable duff of fir needles, rotted wood, and "puffy" black soil. There was much moisture though I noted no seeps. Moist rock rubble is common. Animal life is

remarkably sparse. I saw only a few birds and insects. Ants were the most common. Bill shot 3 *Sceloporus occidentalis*. We saw no skinks though the habitat looks fine for them. Much of the soil moisture must be due to snow melt. There are some diffuse bushes in the canyon, unidentifiable by me.

We ate lunch, took some pictures, and started back. On the ridge we could see for many miles. We could see the Soda Lake Mts., the Kingston Mts., Cima Dome, and the Providence Mts., Mesquite Dry Lake (sand on corner? Hummocks?), Charleston Peak, and possibly the Panamints.

We decided to hike down a steep south canyon rather than return by the ridge. We had no trouble though we had to by-pass a few small cliffs. We returned to camp after going through a very pretty canyon with steep walls, much xeric vegetation and many lizards (*Sceloporus occidentalis*) and birds (including pinon jays).

At camp we found Dick waiting with everything packed. We caught another skink, who was running from bush to bush in the hot sun, and left. The visitors had been 2 men in a jeep, 1 of whom was running cattle at the spring.

We drove to Baker, bought food, and left for Saratoga Springs. At the springs we found several parties camped. The rushes of the spring had just been burned off. The place was a shambles. The little fish will have to be resistant to stand the potash that will be dissolved in the water when the ashes blow in. We found the man who had done it. He said he was trying to kill the mosquitoes. He said he was going to put oil on the water next. We left, much disgusted with the whole thing.

Southeast of Saratoga Springs, on the other side of the gap through which the Amargosa flows is a stringer of sand extending from a spur. It is about 350-400 ft. long and 40 ft. high.

We drove up, on a gravel road, to Ibex pass. Above the dunes 2 mi. S. of Saratoga Springs the wash holds considerable sand and there are some blowups on the west face of the hills.

We drove to Death Valley Jct. and reported the Saratoga Incident to the Monument Rangers by phone. He informed me that the land was owned by an Englishman living in England, and thus private property, and that the head ranger was going down tomorrow and kick the people off for trespassing. Maybe he won't get to oil the water after all.

We met Larry Lambert at Death Valley Jct., a nice red-headed chap whose name's familiar though I can't remember from where.

Bill got permission from a Mr. McCall to camp at Fairbanks Ranch. There are 2 McCalls, who by various methods supposedly including shooting, has cornered most of the land in Ash Meadows including some valuable clay mines.

After much trouble we found the ranch. It is a small ranch of 6 buildings including a small ranch house. There are cottonwoods and tamarisks around it. A spring flowing several gallons per minute is right outside the door. There are fish (*Cremichthys*) and *Hyla* and bullfrogs and crayfish in the water. It is excellent drinking water. The ranch is situated in an open valley between low clay bluffs. The bottom land is alkali encrusted and grassy in some places. There are a few horses. Being very tired we hit the sack as soon as possible.

April 28, 1950

Lime Kilns, Wildrose Canyon, Panamint Mts., Inyo County, California

We got up quite late. I wrote notes while Bill and Dick collected insects along the streams running from the main spring.

About 10:30 we left and drove to the big pool of Fairbank's Springs. It is about 4 or 5 times as large as the one at the ranch house. It is composed of 2 pools 6-8 ft. across. The water flows rapidly from both. None the sand of the bottom boils furiously in the inflowing water. The water is somewhat warm (80+ degrees C.) and is very clear.

At the junction of the ranch road and the main road we met Tex McCall and son and an oily-looking character who stayed in the car. Mr. McCall is a rugged sort who has a quick mind—as can easily be told by his conversation.

He had planted *Rana catesbiana* in his springs. In this warm water and desert climate he claimed they came to maturity in one year. For food he planted crawfish in the springs. They were very numerous in the springs.

He had also planned to raise tropical fish in the pools and to sell the ooze from the spring bottoms as plant food. It is high in soluble calcium and organic matter he says.

We drove on up a broad valley to Lathrop Well (a small village of 8 or 10 buildings) and on to Big Dune, west of this locality.

Here the sand has been piled into a longitudinal ridge of whitish, fairly coarse sand. There is little vegetation except *Larrea*, *Franseria*, and another unidentified shrub.

Only *Callisaurus* were found on the dunes. It seems certain that *Uma* is not present. We ran several *Calli*'s down by tiring them out. The open country and the lack of mammal holes made this possible.

Leaving this locality (after taking a leopard lizard and a *Coleonyx* under the same bush) we drove to Beatty and bought gas and lunch. Then we drove to Ryolith[?] and showed the sights to Dick and ate lunch. Then we took the Titus Canyon Rd. It leads up on a good graded road to a summit of about 5,000 ft. and drops down into Leadfield. This ghost camp consists of many mine shafts and a few old buildings. Celestite seems to have been the main mineral mined.

After leaving the flat of Leadfield the canyon narrows rapidly and its walls go up in a series of cliffs over 1,000 ft. We wound around on the canyon floor for about 2 miles. We came to Klare Spring, a little flowing stream trickling out of the base of the cliff. Quite a few rushes grew around it. There are a number of petroglyphs on the rocks east of the spring.

The canyon became even narrower and finally there was only room for one car.

Shortly we emerged from the canyon onto a broad alluvial fan leading down into Death Valley. The entrance to Titus Canyon is scarcely visible.

We drove on to Stovepipe Wells and there saw the historic "four-holer" said to have been used at Rhyolite and Bullfrog.

Up the alluvial fan of Emigrant Wash, past Harrisberry Flats and down into Wildrose Canyon we drove. At Pipkin's place we got milk and then drove up to the lime kilns. We made camp in one. The air is quite cold outside and the warmth of our juniper fire inside the spacious kiln is wonderful. There are 10 kilns of stone and cement about 0 ft. high by 3 ft. wide across the base. There is an arch door about 4 ft. high and a vent on the opposite side 12 ft. up. Smaller vents circle the bottom. There is a nice flat floor.

To the sack.

April 29, 1950

Van Nuys, California, Los Angeles Co.

We got up rather early after a good night's sleep. The kiln had been warm all night even though it was close to freezing outside (it did freeze at Mahogany Flats).

After breakfast we hiked around Mahogany Flats but the ground was far too dry to support salamanders.

We started up the trail to Telescope Peak. This trail is a fine one as it is maintained by the park service and probably by the many Alpine Club members who climb the peak.

The trail passes along the east slope of the Mt. in an intermittent pinyon forest. Shortly the trail emerges onto a slate talus slope vegetated by miniature Great Basin sage (*Artemisia tridentata*) and then passes over the ridge into a 3 or 4 acre meadow (Arcane Meadow) filled with this sage.

Gopher burrows are very numerous in this meadow and are found nearly to the top of the peak. About ¼ mile before reaching Arcane Meadow we saw our first limber pine (*Pinus flexilis*).

South of the meadow, on a rocky limestone slope is a considerable open stand of contorted limber pines. There is a thick covering of soil here and many downed logs. Rocks are numerous. We searched diligently for salamanders here but temperatures were too low (+2 degrees C. at 5 ft., 16 degrees C. at 5 in.).

There was ice under the shaded logs. This locality seems to be one of the best prospects on the mountain for future collecting however.

We walked on around the west slope of the mountain over talus slopes, in a biting cold wind. We could see the peak close in front of us to the south. Its slopes are covered with a very open growth of foxtail pine (*Pinus balfouriana*? *aristata*). At about 10,100 ft. Dick turned a rock and a *Sceloporus graciosus* rushed out. We caught him. He was a beautiful male. Bill and I decided we wanted to go to the top as it looked so close. Dick wasn't so eager, perhaps being a little wiser. We crossed to the east slope again and started to go up. Shortly we came to our first foxtail pine. It is a very distinctive tree [drawing]. In habit the tree is more compact and erect than the limber pine.

We ate lunch (Vienna sausage, chocolate, and bread) in the lee of a barren slope and then hiked on to a series of rugged switchbacks which we ascended at much expense of energy. On this trail we met a group of fellows coming down from the peak. They said it was not far ahead (and up).

We continued on, eating snow from the occasional patches we met along the trail. Finally we hiked around a ridge and up ahead we could see the summit marker.

At the top I opened the Sierra Club register and found an item saying "Little Jimmie Jones, aged 3 ½, walked all the way." Dick about folded up (as did Bill and I). We also found notes by Sam Houston, T. Dobzhansky, William Hovarnitz, Robert Stebbins, and Wade Fox.

Back down the trail after rest and pictures. We caught a *Sceloporus graciosus* at about 10,700 ft. (gravid female) with her mate. The wind was cold and the hike long back to camp but the view and the flora and fauna had been well worth the hike. Dog-tired we started for home. The trip was an easy one. At Pearblossom we stopped in a little café by a gas station and met a group of strange characters including a bunch of big[?] men climbing over the house, a British wit called "Irish", and a drunk man and

woman who had “never heard of Telescope Pete even though we’ve lived in these parts for 35 years”—

At home I hit the sack.

Guiracoba trip

August 2, 1950

Tucson Mt. Park, Pima Co., Arizona

Late yesterday we left Los Angeles and drove as far as Palm Springs where we slept out in the dunes. We arose at about 7:30 AM and drove toward Yuma via Indio, the east edge of the Salton Sea. The road there is still under construction.

At the Yuma Dunes (Algodones) we shot a male *Uma n. notata*. It had the latero-ventral red patch which bears out my conclusion concerning this form.

Dick and I took a very refreshing dip in the All American Canal and then we (Bill Reeder, Dick Zweifel, and I) drove off toward Gila Bend. The day was hot (104 degrees), clear, and dry.

About 12 miles north of Tucson we turned right at Cortaro toward Tucson Mt. Park. This park proved to be a very fine stand of saguaro and other Sonoran Desert vegetation.

We made camp just after dusk near a streambed. This wash flows between rocky hills and is choked with ironwood, mesquite, and a great many animals. A recent rain has brought out many plants and animals. We found many very tiny *Bufo punctatus* and several small *Scaphiopus* sp. (looks like *couchii*). One 4 or 5 in. *Bufo alvarius* was taken. There was no standing water in the stream, only moist sand.

We watched millipedes walking around. The way the “waves of feet” are used in locomotion suggests that a slow nerve impulse might generate each locomotion wave.

There are hoards of insects out (solpugids, all kinds of beetles, noctuid moths (a colorful orange, black, and white one), mantids, etc.

So off to the sack—on a cot, thank goodness.

August 3, 1950

35.2 miles south of Hermosillo, Sonora, Mexico

We got up, ate a hasty breakfast and drove into Tucson. At the Pima County Clinic we obtained a prescription to obtain Chloroquin, a malarial suppressant drug.

After buying the drugs and other items we left for the border. We were able to get by the border with only a token inspection by the aid of a couple of well-placed dollar bills.

We drove on south between huge thunderheads which poured rain onto the surrounding mountains.

At dark we began picking up DOR snakes. We collected our first tiger rattlesnakes (*Crotalus tigris*), coral snake (*Chironactis*), and indigo snake (*Drymarchon*).

After investigating a chorus of *Scaphiopus couchii* in a series of roadside ponds, we drove until we found a camp spot. The *couchii* were seen floating inflated in the center of the pond, calling with their pained voices. In New Mexico I have noted that *S. hamondii* has this same floating habit and where *couchii* occurs with it, *couchii* is restricted to the pond edges.

Our camp was near the road under some big mesquites. A violent lightning display occupied the sky to the south of us.

At about 3:00 AM we felt rain which rapidly became heavier. We got up and packed up preparatory to driving through the storm. Our tent was deeply buried and it was so hot that sleeping inside it would have been very uncomfortable. Just as the packing was completed the rain stopped. We were beset with indecision and decided finally to stay. No sooner than we had finished setting up the cots than it began raining again. We said to hell with it and went to sleep. It rained fairly hard but we didn't get up and finally it stopped.

August 4, 1950

Just south of Obregon, Sonora, Mexico

We got up and drove into Guaymas. At the Instituto de Pesca we met Sr. Faro who informs us that there is another fish man arriving from University of Washington. The new man and Rene Nunez were in Mexico City at the time of our stop.

We drove out to the sand spit to the cantina and had a couple of beers and talked to Manuel the bartender. Jessie, the other bartender, was in jail at Hermosillo for some unstated crime. (He was teaching in the jail).

The paved road now extends 52 miles south of Empalme. We found that the Yaqui River pango (ferry) had been washed out so we had to drive to the new Yaqui River dam to cross. This amounted to a 25 miles detour over a lousy road. It was dusk when we crossed the Yaqui. We could see the river flowing near the road bed across the bridge—muddy and churning.

After a brief stop for dinner we drove on through Ciudad Obregon and camped in a flat south of town.

August 5, 1950

Arroyo Cuchiyaqui, Sonora, Mexico

When we woke in the morning we found a garden of flowers surrounding us. Thousands of bright orange flowers (*Melastomaceae*?) and equal numbers of *Geraniaceae* (pink) flowers were blooming in the flat.

The ferry across the Rio Mayo is a double one, and because of the swift current, is very fast. It cost us 3 pesos to cross.

Navajoa is a big sprawling unkempt place on the hot coastal plain. There is a huge building housing a market place, near the center of town. All sorts of fruits are piled in heaps on oblong cement benches, limas, sapotes, papayas, oranges, bananas, etc.

Outside in rows of little separate stores all sorts of things are sold—clothing, furs, leather work, soft drinks and all sorts of other items.

We bought some bread and gas, and left for Alamos. The day was very hot and muggy. It was amazing the amount of water we drank enroute.

The vegetation increased in density and verdure as we approached Alamos. Rugged mountains rise up before the valley of Alamos is reached.

We stopped in a deep arroyo (Agua Marina Canon) in the midst of the forest. After lunch we wandered around in the forests. All sorts of beautiful butterflies flitted around and Dick flitted after them. All sorts of trees—amapa, fig, manto, palo santo, laurel, and all kinds unidentifiable by me covered everything with greenery. We picked

up the 2nd or 3rd specimen of *Phyllorhynchus brownii fortitus* on the road. *Callisaurus d. brevipes*, a grid-iron-tailed lizard is quite common. This animal is one of the most strikingly colored of lizards of my acquaintance. Dorsally it is a rather drab brown unicolor but ventrally patches of brilliant emerald green and orange are found.

Before taking flight this lizard curls its tail and waves it from side to side.

In Alamos we bought gas and made enquiry about the road to Rancho Guiricoba. Johnny Hilton, John Hilton's boy told us the Arroyo Cuchijaqui was waist deep and we would have to take a long route which we could not hope to make without chains (which we don't have) because of mud. Another fellow—Tomas Garcia—told us the arroyo was only bumper deep and that we would have no trouble.

The town of Alamos is a beautiful place. It is old and partially deserted. A beautiful old cathedral chimes out the church call on its bells. The streets are narrow and paved with cobbles. Huge Indian laurels shade the plaza. The surrounding valley is bounded by high rocky mountains.

It is said that some of the streets are guarded and never have had an automobile on them.

We drove out of town past the "Skonk Works" (a tannery) after being "taken" by our guide for 10 pesos. I guess there are city slilckers everywhere to take advantage of us poor country boys.

The bark of a certain Mimosaceous tree (looks like a manto tree) is used for tanning. We could see where the bark had been sliced off these trees along the road. The instructions were to keep "siempre izquierda." After reaching the arroyo on a very poor road it became evident that we were on the wrong road. We turned around and took another road to the right and again reached the arroyo at the wrong place. We drove back 12 miles and found a road to the left that we had missed. After a fairly short time we came to the arroyo and crossed with water up to our hubs.

It was quite late and we camped shortly near the Indian village of Cuchijaqui and hit the sack immediately.

August 6, 1950

Rancho Guiricoba, Sonora, Mexico

We got up fairly early and started for the ranch. The road became rapidly worse. It was rocky and very badly eroded. In some places it was so steep that low range 4 wheel drive was the only thing that got us over.

We picked up a Mexican (Serapio Ramirez) with a 45 strapped to his belt, about 2 or 3 miles north of El Cajon and put him in the back. The rough road caused him to be continually hit on the back of the neck by the bow which holds up the top. Every time I got out to open a gate he was smiling like mad and making a big joke of the whole thing.

Finally we reached El Cajon, a sluggish stream flowing between rows of huge *Taxodium* (cypress) trees. These trees have swollen bases and great arched roots. In the stream jojarra (ciclids) were common. We let off our hitchhiker (he left his spurs in the truck) and crossed the creek. The road became somewhat better and before long we passed through a village of thatched roofed mud and wattle shacks and then through a bar gate (opened by 2 little ninos for 10 centavos—they objected that amount as too little, but we objected that it was too much, after our 10 peso affair in Alamos).

This was Rancho Guirocoba (meaning buzzard head in Mayo, the Indian dialect). The ranch was set in a foothill valley between short-tree forest covered hills. In the background we could see the scarp of the Sierra Madre Occidental. Many thatched roofed wicker work houses were scattered amongst plowed fields. Corn, cotton, and beans appear to be the main crops.

On a little rise, near the arroyo bank we could see a group of white stucco buildings surrounded by a rock wall. We drove in the gate and met Clay Montgomery, the caretaker. He is a gray-haired man with a moustache, glasses, and a sort of omnipotent air.

He was very hospitable and invited us in for dinner. We met Mrs. Hoy, his mother. She is a bright-eyed old lady, over 80. They sat down and dinner was served to us—some sort of ham, “strawberries” (a sort of bean mush), mashed potatoes, and manzana bananas with crystalline sugar. We met Angelita, Clay’s daughter, who is visiting from Mochis, Sinaloa; Marguerita, another smaller daughter, Rodney and Jimmie, two of his sons; and Clay’s Mexican wife, Rosa.

The house is finished with clear wood and has a stone fireplace, 2 screen porches, a shower bath (water is poured in a tank at the roof, and a kitchen with a unique cement stove. Half of the roof is thatched and the other half is tar-papered. We washed up a little in one of the bedrooms using an old wash stand and rainwater (full of mosquito larvae).

After dinner we were shown across the yard to a big storehouse where a corn room had been cleaned out for us. It is a high-roofed stuccoed room about 25 feet long by 10 feet wide with hand hewn cedar beams and a thatched roof and porch. We swept out the adobe floor and were supplied a cresote solution to spray around to kill cockroaches (the largest I have ever seen).

We unloaded the truck—I was completely amazed that there could have been so much junk in one small truck. We cluttered the whole room with it. With the aid of a pile of cedar planks and boxes we put up several long shelves and piled our material in them. We hiked down the arroyo and I located a couple of pools in which I saw ciclids and gobids (*Awassus*) as well as the ever-present pocciliids. As I couldn’t get Dick to seine we had to wait until the next day.

Back at our Hotel Guiricoba, with the aid of Clay, we set up a buying system for reptiles. Bill set his traps and Dick and I hunted frogs and toads. At a stone dam (presa) just below the ranch house we caught a culebra verde (*Thalerophis*) and a rana verde (*Agalychnis dacnicolor*). The latter is a huge hybrid frog (tree toad), bright grass green in color, with large expanded sticky toes. It lays its eggs on the under sides of leaves.

The ninos began bringing specimens. We got a large series of the common toad *Bufo mazatlanensis* (10 centavos por uno) and a few *Scaphiopus*.

We hit the sack. The heat was considerable and made sleeping difficult. However, to our pleasure we noted no mosquitoes.

August 7, 1950

Rancho Guirocoba

After breakfast Dick and I went downstream and seined the pool around the dam and got 4 species of fish. We went upstream and seined a few shallow pools. We took a few mojarra (ciclids) and a big gillicthys? (*Awassus*). Rodney (who speaks no english)

showed us the swimming tank where we saw several majoarras but it was too large to seine with our beach seine (10 ft.).

Back at our suite the reptiles began coming in. We got a small boa (*Constrictor constrictor insperator*), a hatchling coral snake (*Micruroides*), and a lot of *Sapos* (toads), and 2 or 3 culebra verdes. Dick and I tagged and pickled until we were up to date.

In the evening we talked to Clay and Mrs. Joy. They told us about the ranch. Before the agrarian movement was started there were several thousand hectares more of farming land on the ranch. At that time there were all sorts of artisans employed by the ranch—cabinet makers and blacksmiths. At present this ranch is about 12 miles long by 7 miles wide and encompasses a fair proportion of good farming land. The ranch is owned by a group of Los Angeles businessmen—Bill Scheffler, Ed Ainsworth, and others. Adrian vanRossen used to own a part of it. The northwest part is owned by Clay's wife.

Clay is quite a doctor and keeps a big supply of drugs and equipment in his house. At one time he was a medical student but quit for some reason. He has done all sorts of things. He has been chased by Pancho Villa's men and escaped by hiding in the hills. He has lead a survey party for a railroad to go from the coast to Mexico City, near the ranch. He has acted as a doctor and sold medicine all over southern Sonora. What else he has done I have not found out yet as he doesn't talk much about himself. He says less about Mexican politics as he says no opinion is the best and safest opinion. He is very shrewd in his dealings with the local Mexicans. His treatment is just from what I can gather up but he makes sure that they are indebted to him. When they receive their pay for their crops he rushes in a large stock of various items to his son's store in the village. They usually buy more than they can afford and thus the money stays with him and he secures their indebtedness. He tells about being treed by peccaries (javelina) in the midst of a bamboo thicket, on La Baristo Peak southeast of the ranch, and being able to hear the animals but not see them.

After going to bed I began to feel a little poorly and before long had a fine case of dysentery.

August 8, 1950

Rancho Guirocoba, Sonora, Mexico

By morning it had set in and there was no doubt about what was wrong with me. Luckily it was Bacillary and not Amoebic. Bill had all the medicine for both kinds (sulfamerizine tablets, bismuth subcarbonate tablets, perigoric, and sodium bicarbonate).

I had nausea, high fever, and stomach cramps. As soon as I took the tablets my stomach cramps disappeared and before the day was over my dysentery was gone.

Dick felt like he was getting it too so he took some remedy supplied by Clay.

All day long specimens kept pouring in. We got a live specimen of *Sonora aemula*, the third on record, a vine snake (*Oxyelis*), a red racer, 3 big green *Anolis* (young *Ctenosaurus*), and all sorts of lizards and frogs.

By night I felt good enough to play a few tunes on the guitar.

August 9, 1950

Rancho Guirocoba, Sonora, Mexico

Most of the morning was spent lying around in the shade to keep from breaking out in a sulfa rash.

The specimens keep rolling in. We got a 5 foot boa and an equally big indigo snake, among other things.

Dick and I went down to the dam to try out the emulsified rotenone supplied to me by Robert Miller of University of Michigan. We dumped in about a teacup full and succeeded in chasing the fish through a hole in the dam to a larger pool on the other side.

I went back and got about a half pint more and poisoned the bigger pool (about 60 ft. long by 15 feet wide, and averaging 3 feet deep). Mojaras (Ciclids) came to the top but none of the suckers or poeciliids or catostomids did. I caught a small series of mojaras.

Back at camp we learned that Bill had been having trouble. He had offered a woman 1 peso for each live animal (bat) and 50 cents for dead ones. She had returned with 35 live bats. He reluctantly paid her and emphatically demanded "no mas." He will be stuffing for days on this supply.

We have been learning some of the superstitions concerning snakes and lizards that the natives hold.

When the first rains come there is a turtle (*Pseudemmys*), known as "tortuga Juan" who is supposed to give forth with a call "Don Juan, Don Juan, Don Juan"—obviously the turtle call is that of one of the many amphibia of the arroyo.

They believe (as does Mr. Montgomery) that the Pichicuati (*Agkistrodon*) whistles—a single note repeated monotonously. This call probably comes from a *Bufo* (*mazatlanensis*?). They believe that the vingarbon (vinegarrillo) is more poisonous than the rattlesnake or the pichicuati or the coral snake. The vine snake is supposed to suck on the teats of cows and make them hard and dry. The story of the ajolote entering the female genital tract is also prevalent though the ajolote is not *Bipes* the two-legged lizard, but a skink, *Eumeces callicephalus*.

August 10, 1950

Rancho Guirocoba, Sonora, Mexico

This morning I went out with Bill on his trap line. He had it set up on the slopes of a mesa in the midst of the forest.

Quite a number of *Perognathus* were in the traps. Most of them were badly eaten by ants. He had set 2 steel traps in the arroyo but neither had an animal.

By the time we returned Bill was feeling very tired and before long he came down with bacillary dysentery. We gave him the remedy and put him to bed.

We started buying some bread and tortillas from Loretta, the Montgomery's cook. She also does our laundry (irons it too). The bread (biscuits) is very welcome for lunches and costs very little.

We got another big boa and a coral snake today.

August 11, 1950

This morning Dick and I went down to Canon Negra. I tried a little fishing in some of the big rocky pools. The moharra would follow the lure right to the edge of the shore but would not strike it, possibly because it was so large. Later I switched to using minnows for bait and started hauling in the fish.

Later in the day we went back to seine a big pool in which we had seen a *Pseudemmys* (turtle) swimming. The water was warm, muddy, full of moss and burro dung, and therefore the job was most unpleasant.

Furthermore the fish we got were not numerous or of any new kinds.

Bill was feeling better when we got back and ready to go tend his traps from which idea we could not dissuade him. The sulfa pills are apt to cause a rash if one becomes active too soon after taking them.

I took a short hike after an iguana, which I had seen in a tree. I was accompanied by Ernesto (Clay's son) who told me the names of plants and other things. He showed me the pitahaya plant, a tall cactus, which has wonderful fruit in May and June. The huge cypress of the arroyo are called "sabino". Another very spiny plant with a big knobby fruit is called "papanche". The fruit is supposed to be orange on the outside and black inside when ripe (or at least this was my translation). He pointed out encinos (oaks).

Later in the day I bought a big Mexican beaded lizard from a Mexican. We put it in a big can as it was alive and later we noted that there were 3 conical eggs in the can. We inspected the lizard and found that it had 2 purplish prominences protruding from its cloaca, closely resembling hemipenes except that they were not as large.

After killing her we found 11 more eggs in her oviduct. They are variable in hardness—some are completely calcified and others have very soft shells—none are pliable like a snake egg [drawing]. They are cream colored. Some are more rounded than others.

During the evening the valve trombone played and we could see lights in the village. It was a birthday party.

(These proved to be quail eggs in the gut of a male lizard—KSN)

August 12, 1950

Rancho Guirocaba, Sonora, Mexico

This morning we went to "Cienegita" with Clayito (another of Clay's sons) a kid of about 12 or 13 years. He has a typical Mexican haircut and rubber tire shoes consisting of a section of truck tire and 2 leather thongs.

He lead us up the arroyo by several fields, over a little ridge (where we caught a vine snake that was crawling on the ground) and down into a little draw, up over another ridge and into Cienegita.

The Cienegita is a small valley set between high peaks. 2 or 3 small streams flow along rocky courses forming series of pools. There are cypress (*Taxodium mucronatum*), sabal (*Erythea*) palms and many oaks madronos, and other trees. The floor was often covered by a 2 foot growth of a small mimosaceous plant.

We wandered around looking for bats. In the sparse fronds of the sabal we could see movement and hear squeaking sounds. Bill shot up into the fronds and a huge stream of bats poured out. There must have been 1,000 in the fronds (*Myotis*). Bill picked up about 20. We shook a lot more palms and saw a big blondish bat (*Lasurus*?) fly out. Bill thinks he saw a bat with mottled wings.

Dick and I and Clayito went hunting for skinks and caught one under some rocks. We saw another under oak bark lying around an old "palo seca". We caught a bunch of pocciliid fish with dark gold flecks over their bodies and then went swimming in a nice cool pool overhung by trees with bromeliads hanging from them. We caught a big

culebra preita (*Drymarchon*), ate a meager lunch, and hiked back. The heat had become intense, and cloud cover increased the humidity. All of us but Clayito were rather poohed out when we reached the ranch, not from the hike (about 6 miles) but from the heat. We paid him 5 pesos and lay down for a while.

In the afternoon it clouded over and began to rain at dusk—we had a nice rain, with lightning, until about 12 midnight.

About dinner time I smelled something very dead near the stoe. We searched around for about ½ an hour and finally Bill held up a sack with a dead rat in it saying, “Could this be it?” The thing smelled so bad we cold-blooded vertebrate zoologists couldn’t go near it.

Rodney or Ernesto shot a deer during the night (a forked horn in the velvet). Bill supervised the skinning and worked on the hide until we went to bed. The deer was killed with some buck shot I had brought along.

August 13, 1950

Rancho Guirocoba

A short hike to Canon Prieta at mid-day rather poohed me—the heat is intense and the nearly daily showers keep the humidity almost to saturation.

We got our first tortuga colorada (*Geoemyda*). It is a turtle without webbed toes, that looks something like a *Pseudemmys*—that is, it looks aquatic. Its marginal scutes are turned up at the edges, giving the animal a distinctive appearance.

Ernesto brought in a beautiful *Lampropeltis doliata nelsoni*, a red, black, and white king snake, which, of course, they thought was a dreaded coral (coral snake).

A micruroa was bought in during the day, alive. The animal was quite vicious and made sideways passes with its head when striking. A couple of times it bit itself with no apparent ill effects. The heat may have caused part of its fury. By evening I began to have qualms and lay down.

August 14, 1950

Rancho Guirocoba

I spent the day on my cot, ate a little soup, and read *Horse and Buggy Doctor*, a very good book. I could tell I had a good fever and a rather fast pulse rate. Since I also had dysentery I took the prescribed medicine every 6 hours.

The specimens kept pouring in irregardless of either Dick’s or my physical state. One little fellow came in repeatedly with grasshoppers. The little fellow wore a shirt and no pants. I think it is somewhat taboo to go around without a shirt here.

August 15, 1950

Rancho Guirocoba

Spent this day in the sack also. By evening, after dosing myself for dysentery for 2 days, I became convinced I was suffering from heat exhaustion.

I found I could eat salt and not mind the taste—so I ate more and shortly my fever lessened and my pulse became slower.

Clay told us a few stories of his youth. I guess he has always lived on a basic plane. For example while returning from the coast he stopped off at a ranch for the night. He had a Jalisco serape (with a slit for the head. The girl of the house admired the

serape and remarked that it would be nice to sleep under. Clay found that the father and brother were in town. When the mother complained of a headache his course was clear—he gave her sleeping pills. Later ('neath the serape I suppose) the girl began protesting ("Mama, Mama"), but ceased when she was told her mother couldn't be wakened by a freight train.

The specimens keep coming in—averaging about 7 snakes a day. Tomorrow I think I shall eat a little.

August 16, 1950

Rancho Guirocoba, Sonora, Mexico

Things look brighter today—that is I feel good but weak.

Clayito turns out to be the growing businessman. He has cornered the slingshot (tirador) market here (800 people) by controlling the source of rubber inner tubes. For 35-40 centavos one can get the materials from him. He does guide work for a fee and has formed a snake gathering company where the profits of members are split. As president I do not doubt that he gets a salary. He brought us water for our olla and wouldn't stop until I paid him. I had planned to pay him later in the afternoon but we would have been flooded out and broke by that time. He is 10 years old and has bought his own clothes and is planning on buying 2 heifers (200 pesos each) and no doubt will reap a great profit on their sale.

I ate some tuna and rice for dinner and still feel fine.

August 17, 1950

Rancho Guirocoba, Sonora, Mexico

I have been feeling better today except for stomach pains. I didn't do too much moving around. I thought it unwise and anyway the heat and humidity are such that a short walk at midday leaves one soaked with perspiration. In the afternoon I hiked up a nearby rocky canyon with the .32 rifle.

Some still pools containing lots of tadpoles occupied potholes in the arroyo. There were fig trees growing with pitahaya cacti. Many vines clung to the cliffs and trees.

I was disconcerted at the end of my hike by passing quantities of mucous and some blood—as I was no longer running a fever or week with dysentery this was a very unhappy development pointing toward amoebic dysentery.

I told Dick and was pleased to have him agree that we ought to leave to seek medical assistance if my condition warranted. Bill later agreed so we began to gather our stuff together.

August 18, 1950

Rancho Guirocoba, Sonora, Mexico

It was agreed to leave on the morning of the 19th, so we began packing. I took 3 .2 gram tablets of diodoquin after each meal. 2 doses stopped my stomach pains and by evening I felt completely normal but we still thought it best to leave.

The people at the ranch have been praying for rain. Their crops are not growing fast enough—up till now we have been watching with them but now we hope rain will desist untill we cross the Cucujaqui and no longer.

The specimens kept coming in. I was able to catalogue my first *Tremorphodon*. This form has well developed and differentiated anterior fangs. I was unable to see whether they were hollow or not.

All night long rain threatened and we could see much lightning in the direction of Alamos. Very little rain fell on the ranch.

August 19, 1950

A few miles north of Navajoa, Sonora, Mexico

We arose, finished packing, and said our goodbyes to our most wonderful and hospitable hosts and drove out of the ranch on a dry road. We took our 102d snake from the ranch at the house and the 103rd near the gate (*Coluber bilineatus*). The ninos were on hand to open the gate for 20 centavos—shortly we reached and crossed the Cucuhaqui with no trouble at all. We stopped and seined the stream taking a good series of catostomids, *Gillichthys*?, a small anchovy-like fish (*Thyrina*), mojarrahs, a few catfish, pocciliids, and minnows.

Off we went—toward Alamos. In a couple of places we had to go around muddy areas but we had no trouble. It was 20 miles from the ranch to the Cucuhaqui and 8 miles from there to Alamos. As I have said before the road is one of the worst I have ever driven, being gullied, rocky and steep.

At Alamos we met John Hilton and wife. He is a painter and writer (author of *Sonora Sketchbook*). He is a nice enough chap, somewhat vain, possessing a considerable fund of factual information with a decided tendency to gild the lily. He is working an amethyst mine nearby.

On the way to Navajoa the road became muddy (from a rain earlier in the day). Shortly we ran into a very heavy storm. Even though we passed through the fringes it was almost opaque for distances of more than 100 yards or so.

After buying gas at Navajoa we passed over the Pango. The river was swift and full. The approaches were slick and steep, making the entry onto the Pango rather tricky. 2 planks are placed down for the wheels of the car and you drive on board. The ferry holds two cars. It is poled across and adjusted to the current by means of 2 blocks and tackles attached to the big steel cable. Most of the motive power is supplied by the current.

The road was very sloppy and full of muddy pools. We drove along full of foreboding, for a while. We met a fellow in a Studebaker (with chains) who said he had been stalled 5 times with the high water and 1 time had had to go around by driving on the railroad tracks. The water was up to the doors in 1 arroyo and he had to pull through on the battery. He said he wouldn't try it again and thought we hadn't a chance without chains.

A little farther down the road we came to a big truck in the middle of the road, tilted at a crazy angle. It was in the middle of a 100 yard pool and had gotten just off the ruts a little. He blocked the road. I waded out and found the water was only up to my knees on the road but it dropped off steeply on either side and became a quagmire.

We backtracked and drove up on the new roadbed which is being constructed. It is full of rocks and made a bumpy ride but we got by. A fellow hailed us as we did and asked us to help with the truck. We had to drive down a slippery hill in the road on the other side of the truck to attach his cable. After a little pulling our tires became so slick

that we were sliding off the road and could not even get back up the hill. With the help of a half dozen fellows we did get up the hill. They said thanks and goodbye.

Off up the road we learned there was a nearly impassable stretch where one had to drive on the railway. We decided to wait for morning, praying it wouldn't rain. After nearly getting stuck we got off the road and into the sleeping bag. I was very nervous and downhearted—much more so than is usual in such predicaments. I was practically unable to suppress it. I could see Dick felt similarly but Bill was O.K.

August 20, 1950

About 40 miles N. of Hermosillo, Sonora, Mexico

No rain fell during thenight. I woke up several times to see and was pleased to note nearly clear skies. We packed and drove off. Before long we came to a place with water about hub deep. Water splashed up and stopped the engine. Finally we got it started and it stopped again. This time no coaxing seemed to work until a Mexican worked on it and off we went—only to get stuck in the mud by sliding (inexorably) off the road into a bottomless mass along the road-edge. We really needed chains—so I set about to making them by untwining a rope and winding it around the wheels. With the aid of our block and tackle (attached to a nearby palo verde tree and then to a telephone pole) we got out. I took over the wheel and shortly we came to the worst place—a 200 yard-long sea of utterly impassable mud. Here we drove up on the railroad track and bumped along until we were beyond the mud and then returned to the road—several trucks were stuck along the tracks and on the road.

After this we found no more difficult places and shortly merged onto dry roads and continued into Obregon.

The Yaqui River was low and we crossed on the repaired pango. Much to our surprise the paved road extended almost to the river's edge. It was a real relief to drive onto this pavement. We passed Guaymas and stopped at Bocochibampo for beer and Pepsi Cola. I slit fish and was somewhat dismayed to note that most of the fins were frayed by jouncing over the bad roads.

We ate dinner outside Hermosillo and drove for a while after dark and then camped south of Santa Ana.

August 21 1950

Madera Canyon, Santa Rita Mts., Pima Co., Arizona

At Magdalena I stopped to buy cigarettes for various people—Howard Winn, Art Fleschig, Doc Cowles, and Sy Perkins.

I wanted to buy "Delicados" but none were available so I had to settle for Belmonts (90 centavos a pack). There were several varieties ending at El Tigres at 15 centavos. I almost bought some for Art Fleschig. A cute young girl waited on me and spoke a little english.

We had no trouble at the border though we had a lot of dubious items such as deer hides and skulls, butterflies and other insects, and a hunk of cactus. We showed them a boa (alive) and he was passed all around—then they told us to go.

We drove to Tucson where I went to the clinic for an exam (I was unable to get the exam ad feeling O.K. I decided to continue), while the others had a tire fixed and

bought Bill a train ticket. He claimed to have work to do at home but it was obvious that his true love was calling harder than the mountains.

We put him on the 4PM train with 1 dollar extra. He probably nearly starved before reaching L.A.

Dick and I left for Madera Canyon, Santa Rita Mountains. It is about 25 miles south of Tucson. The road cuts off at Continental and over the broad mesquite and cactus covered bajada into Madera Canyon. There are many deciduous oaks low in the canyon and at about 6,000 ft. The yellow pines begin to appear as the road ends. We camped at about this altitude under some oaks.

August 22, 1950

Pena Blanca Spring, Santa Cruz Co., Arizona

After breakfast and packing we hiked up the canyon in search of good stands of pine with the hope of finding *Crotalus willardi* or *triscatus* or *Lampropeltus pyromelana*. We had a good hike and caught 19 *Sceloporus jarrovi*, a beautiful scaly lizard, which is very easy to noose. I saw a doe who was standing in the entrance to a mine tunnel. When I approached she ran back into the tunnel. A russet-backed junco was very common as was the redstart? (a bird with black wings and head and red and white underparts).

Back at camp we decided to leave for Pena Blanca. We travelled south for about 35 miles toward Nogales and then cut west on the Ruby Road, 6 or 7 miles north of Nogales. This road leads through rolling grass and oak covered hills. As we approached the spring the country became more precipitous and rock outcrops became common. The spring is at the edge of a deep arroyo which runs along the base of rocky cliffs on the south. Oaks and grass are the predominant vegetation. We noted some reeds and pot holes of water as we came in. There is a Coronado Forest Camp at the spring with water and picnic tables. A couple of line riders are stationed here. They are checking for hoof and mouth disease. Dick and I had a quart of milk each and a piece of cake in addition to dinner in honor of the U.S.A. or something. We are hoping for rain so the frogs will come out (*Rana tarahumarae*, *Microhyla*, *Eleutherodactylus*).

August 23, 1950

Pena Blanca Spring, Santa Cruz Co., Arizona

When Dick and I got up this morning we found one of the hoof and mouth disease inspectors (Mr. Forsythe) getting his breakfast. He knew a lot of herpetologists including Dr. Stebbins, C. Bogert, Joc Gorman, and Bill Woodin, all of whom had topped at the springs. He told us about the several vine snakes that had been taken in the near vicinity. He says he has seen them crawling in the grass and in low bushes. He also says where they crawl along the ground they have their heads raised. He told us that the "black frog" occurred at Alanco Spring nearby. This we suspected was *Rana tarahumarae*.

He drew us a map and we left for the spring—a corrected version is included. We drove down the Ruby Road 3.6 miles and turned left onto the Summit Motor Road. 0.2 miles past a tank (on the left) we turned off onto a very dim road (past an old camp fire and an oak tree), which we followed for 0.4 miles to a salting place for cattle. There we hiked down the riverbed, keeping to the left and downstream, for about 20 minutes. We came to a series of pools in a narrow rocky channel. The stream was edged with willows,

big junipers, *Yucca*, oaks, manzanita, and cottonwoods. The largest pools were 3 feet deep and 20 to 30 ft. across. Most pools were located below places where the water poured over rocks. We saw the first 2 *Rana tarahumarae* perched in a crevasse above a big pool. Dick caught them with a butterfly net. They look very much like *Rana boylei* of southern California except they are quite a bit larger. They are dark brown with banded hind legs and black and gold-flecked eyes. We caught several, including a series of tadpoles and metamorphosing young. The tadpoles are quite pretty—their tails are spotted.

Near the lower end of the water we came to a fairly large pool (20 ft. across and 3-3 ½ ft. deep) at the base of a little falls (6 to 7 ft.). The pool was full of *Gila* (*ditaenia*?) (*robusta*?). The little fish would rise to insects or little pebbles thrown in the water. We went “swimming” and tried to catch some but they were very elusive, even in muddy water, and we got only a few. The pool had a gravel bottom, rock sides, and was 22.4 degrees C.

I noted the fish in one other pool and no other. Apparently they have not been able to scale the falls. We noted numbers of very small fry so apparently they are doing well in this extremely restricted situation.

We caught 3 or 4 *Kinosternon sonoriense* in the pools. These little turtles smell lousy as soon as you catch them and from then on.

Rana pipiens was common. We took an adult *Hyla arenicolor* and one metamorphosing young.

After the hot hike back to the truck lunch tasted very good, in the shade of oak trees.

I forgot to mention that we took several *Thamnophis eques* in the pools, which had been feeding on tadpoles. Some were quite engorged and sluggish.

In many respects this area is linked to the south—the vine snakes, a cucurbitaceous plant with stinging hairs capable of penetrating pants’ legs (I saw this plant on the Cape (Baja California), vermilion flycatchers, and several other plants like those of south Sonora.

In the evening Dick and I went for a short hike upstream. Just as we turned back it began to rain. We were saturated by the time we reached camp. Later, after it had stopped we went out and caught a few toads that were out after the rain.

We caught a *Microhyla*, the narrow mouthed toad, the first live specimen either of us had ever seen. We also caught *Scaphiopus*, the spadefoot toad. The type we caught may be *hammondi* but it is different than any I have seen. It is red spotted like a *puncta*—[?] and has 2 characteristic red spots on either side of its axis.

August 24, 1950

Pena Blanca Spring, Pajarito Mountains, Santa Cruz Co., Arizona

This morning we drove over to Yank Spring and Sycamore Canyon, about 7+ miles west of this camp on the Ruby Road. The canyon cuts across the road a short distance west of the Bear Valley Ranch Road. It is a fairly broad wash and can be discerned by a road leading off downstream to the southwest, a wide corral (about 100 yards south of the Ruby Road), and the lack of sycamores. Big oaks and black walnuts form the vegetation.

A short distance downstream we came to the spring, which has been cemented into 2 cattle watering troughs. Across the stream are 2 old adobe ruins said to have been destroyed by Apaches.

We drove to the ruins and parked. The stream flows in a *Baccharis* thicket at this point—sinking into the sand one in a while and reappearing. The stream was full of *Gila ditaenia*, a pretty little minnow. The pectoral and pelvic fin bases are orange and some of the larger individuals show flecks of purple and silver dorsally.

I saw what might be a trogon though I'm not familiar enough with the bird to be sure.

At once place the canyon walls are vertical and pocketed with caves. Tall willows shaded the stream. After chasing a bunch of bats out of the cave I sat down and began tossing insects to the fish. The little fellows struck just like a bass or trout. While searching for insects I saw a bright blue flash along a rock I had moved. I was the tail of a *Eumeces callicephalus*, a beautiful little skink.

I finally caught him with his tail complete. He has orange stripes on his head, a bronze back, a purple tail base fading into a brilliant blue, and blue toes on the hind feet.

A little farther downstream we came to a deep (4 foot) rocky pool shaded by a big willow. In it was a big school of *Gila*, some of which reached about 4 in. long. I hiked back to the truck and picked up a seine and a bottle. One haul was all we made but we took a nice series and got a swim in the cool stream (27 degrees C.).

We discovered *Rana tarahumarae* in the pool and captured 4 adults. Back at the car we ate lunch and then drove back to camp, where we tagged and pickled specimens.

We drove to a tank, 2 miles west of the camp, after dark, but saw nothing but *Rana pipiens*. Back at camp we wrote notes and played the guitar a while and then went to bed. It is a beautiful warm moonlit night.

August 25, 1950

20 miles E. of Gila Bend, Arizona

Dick and I had no plan for today so we pickled specimens and tagged until we had caught up.

We went over to the corral and learned the fine points of a quarter horse from Mr. Forsythe. He raises them and told us all about them from their origination in 1611 in England. Then we hiked southwest up Pena Blanca Canyon about ¼ mile to Mr. Harvey's house. He is a fine old man and quite intelligent. Like Mr. Forsyth he knew the names of all the animals of the region. He lives in a little shack (very neat) under big oaks and walnuts. He has some nice chairs set out under the oaks and an old Model A Ford. From his conversation he has been all over the world and has settled down in his old age (75) to live in this fine climate. He has picked a very beautiful place.

We asked him a lot of questions about the country. These are some of the things he told us.

Yank Springs is named for an old settler, Yank Bartlett, who was ambushed and killed at the adobes near the spring in the 1880s. His killers were either Apaches or Mexicans or both. The adobes stood until 1915 or so.

The vine snake is fairly often seen in the vicinity and most frequently in springs. He had seen a big one (6 ft.) that disappeared under his house about 2 weeks before. He

had seen skinks at a ranch $\frac{1}{4}$ mile upstream from his house but our search there netted us nothing.

The chula (coatamundi) are often seen in spring time and travel in packs up to 40 animals. They are ferocious and kill dogs quite often. He had not seen any for 2 years but had seen their tracks.

Javelina are supposedly common. He seemed surprised that we hadn't seen any at Alamo Spring as they frequent the spot.

He had been visited by Loye Miller and A. J. van Rossem, and Dr. Sally Atsatt, Bob Stebbins, Chas Bogert, Mr. & Mrs. A. H. Wright, and Berry Campbell to mention a few. He knew their names and what they were doing and told us to convey his regards to Dr. Miller (which we shall do). He said he had recently visited Dr. Wright at Cornell.

Dick and I went back to camp and ate lunch. I've spent the afternoon packing and sitting around. I got a little fidgety—we were going to wait for dark and drive the roads. I couldn't stand looking at another bean or even at my tuna ragout (a mixture of tuna and mushroom soup poured over rice or mashed potatoes). I mentioned buying some steak to Dick and we were off. We tried to buy it at Tumacacori and Tubac but those stores dealt only in bologna and "carne por chile". Finally at Continental we got 2 huge rib steaks. We quickly drove off the road and cooked them with mashed potatoes and a quart of milk each. Nothing ever tasted better after 25 days of living out of cans.

Then we drove onto 20 miles E. of Gila Bend and camped. I seemed to have redeveloped dysentery (possibly from overloading my poor battered stomach). I'm inclined to think that dinner was worth it.

August 26, 1950

Van Nuys, Los Angeles Co., California

The drive home was uneventful, slow, and hot (106 degrees F. at Westmorland).

But strangely enough our specimens came through alive. We arrived home about 10:00 PM somewhat battered (15 lbs. lighter) but after a highly successful collecting trip.

Cyril L. Forsyth
P.O. Box 1313
Nogales, Arizona

September 1950
November 1950
January 1951
March 1951

San Nicolas Island
Baja California
Mexico (Sonora, Sinaloa)
Baja California

May 27, 1951

Pushawalla Oasis, Riverside Co., California

After a very hot day (115 degrees F.) we drove up to Pushawalla Oasis.

At 7:45 PM (PST Daylight saving time) the first *Hyla regilla* called in the stream. The sun was just pink in the sky as it set. Air at 5 ft. 34 deg. C., Air 1 cm. above water 33.5 deg. C., water 25 deg. C.

8:10 PM. Two *Bufo punctatus* males caught hopping out of holes in bank toward the stream.

8:26 PM. First *Bufo punctatus* heard calling.

8:50 PM. 13 males and 2 females in stream—no calling except that of *Hyla regilla*.

9:00 AT. 31.4 deg. C. (1 cm over water). WT 25.5 deg. C.

2 adult males found hopping in palm fronds 15 feet from stream and 5 ft. above it (ledge). Skin dry and warty. Probably are what we heard rustling in the fronds. First definite calling of *B. p.*

9:15 PM. Calling very sporadic. *Hyla* in good chorus. *B. punctatus* can be heard calling when *Hyla* quiet—apparently they are not closely controlled by *Hyla*'s call.

9:20 PM. 12 males in ½ of stream, 2 females (both look fairly spent) and 2 small toads—apparently yearlings and not able to breed. Toads generally in pairs—no amplexus. Male and male and male and female.

9:35 PM. Two male and male amplexus. I note that when males are picked up now it seems easier to induce their calling. Toad chorus very sporadic.

9:45-10:30 PM. I placed the light on the bank near 2 *B. punctatus*. Before long one adult male reacted sharply to an insect flying around the light 8 ft. from him. It was a small noctuid moth. In a roundabout way he popped over to the light and began feeding. I don't think he was attracted by the light but by the flying insects. When feeding he leaned slightly forward and flicked his tongue out at the insect—moths. Moths, flying ants, small flies of one sort and another, and beetles were eaten. The type of insect seems to make no difference. He caught and ate small stones and bits of wood dropped in front of him. Often he saw very small beasts 3 or 4 inches away and hopped over and swallowed them, some so small I couldn't see them from 1 foot away. There appears to be a definite upper size limit to food at about the size of a medium-sized moth. Both this toad and a *H. regilla* followed one of these moths but neither attempted to eat it.

Peripheral vision is very acute. *B. punctatus* can detect movement almost directly behind itself. Many times the little toad turned nearly all the way around to catch an insect. Sometimes they jumped short distances for their food.

I suspect that most of their food normally consists of small insects which flit very close to the surface of the stream, as I saw 2 animals feeding on these insects. They were able to flick up food about 1 ½ inches in front of them.

Respiration is quite sporadic and sometimes only 1 side palpitates at a time, whereas the nasal valves both appear always to open together and in perfect synchrony with respiration.

At the base of the urostyle at the insertion of the hind legs, I noted 2 little palpitating spots—out of phase with respiration but still irregular but not spasmodic. Probably they are blood vessels reflecting heart beat.

11:10 PM. Occasional calling continuing. *Hyla* chorus has largely ceased at present. While the stream is full of toads very little calling is going on, and no amplexus. Temperatures are perfectly adequate (29 deg. C.) but apparently the breeding period is over. The few females are spent and do not have the bulging appearance of early spring females.

2 and possibly 3 sizes of tadpoles are present in the stream, one like this [drawing], and one somewhat larger [drawing]. I could locate no eggs on the bottom. No *Hyla* were seen in amplexus.

Male *B. punctatus* would move about the light with no attempt at amplexus with one another and a female tossed in front of them elicited no response other than avoidance though it was repeated several times. Thus the males as well as the females are not at the height of breeding condition

September 7, 1950

San Nicolas Island, Ventura County, California

Bob (Norris) and I drove out to Pt. Mugu Naval Station for the second day in an attempt to get a plane to San Nicolas. Yesterday we took off at 2 PM but couldn't land on the island because of heavy fog.

Today we flew past Anacapa and Santa Cruz and after a 25 minute flight we saw the coastline of San Nicolas. We flew the length of the island and circled to land into the northwest wind. This gave us a view of the terrain. It is very barren. There are no trees and most of the island is grass covered. The island is composed of a series of terraces (marine). There are several, one at 50 ft., a small one at 150 approx., an extensive one at 300 ft., another big one at 500 ft. The crest of the island is 907 ft.

On the west, at least, the terrace edges have been badly eroded into badlands. Bob tells me that the island is an anticline composed chiefly of Eocene rocks (sandstones and shales) overlain with Pleistocene and recent deposits which contain much shell material. We saw a volcanic dyke cutting lengthwise on the west coast.

Kitchen middens of mussel, abalone, and a big turban shell (and all sorts of other shells—limpets, urchins, etc.), mixed with charcoal fragments are very common on the lower terraces (up to 500 ft. at least). Also common are rounded stones, some certainly implements, all broken. We found one metate.

We are being put up in the B.O.Q. by the navy. Our meals cost us very little (30 cents for supper, 50 cents for dinner) and are ample.

Bob and I went for a short hike to an old Army barrack area (1940-1944) and to the beach to a seep he calls "Celery Springs." It has quantities of an umbellifer resembling celery growing around it. The water seeps out of an overhanging bank about 50 yards back of the beach at about the middle of the east side of the island.

Later we went hunting *Xantusia riversiana* under rubbish around camp. We got 4, 2 with one pattern and 2 with another (see species acct.).

Bob informs me that in the 1870s the island was subdivided into city lots. Later it became a sheep ranch—overgrazing has been responsible for much of the erosion on the island. In 1940 or so the Army used it as a lookout station and now it is in Navy hands.

I will be glad to get some sleep.

September 8 1950

San Nicolas Island, Ventura County, California

After a 7:00 AM breakfast we drove up to the high point on the island and began a series of samples and dips and strikes down a northeast canyon which cuts through the terraces from the high point.

At 750 ft. (summit 907 ft.) we investigated a big kitchen midden of abalone, limpets (keyhole and otia), and mussels. We could see the darkened earth where the fires had been. All the rounded stones were broken.

One peculiar thing, quantities of smaller shells (limpets and gastropods) were associated in the midden. It seems hard to believe that these small shellfish were utilized as food.

Considering the long distance from the midden to the shore line it also seems difficult to believe that the food was transported from the present shore line—possibly it was cooked along the shore when the water was at least to the 500 ft. level. This would have left an island about 2/3 the size of the present one.

Down in the canyon we could see numerous fox and mouse tracks. The mice make regular highways in the streambottom. They are very numerous.

Plants consist of a shrubby composite which sometimes attains 6 or 7 feet, a euphorb that forms low, spreading bushes, morning glory vines, a bush lupine with grey foliage and purple flowers that forms numerous low clumps on the hillsides, and several other species.

Near the edge of the 500 ft. terrace (450 ft.) we came upon a layer of quaternary material composed largely of shells of littoral invertebrates. We found a few bones (probably bird remains) among the fossils.

From this point the canyon pitched rapidly downward as the sandstone beds dipped on the northeast limb of the Anticline.

Before long we came to a place where the canyon floor was soggy with moisture. The sand shook like jelly when we stepped on it.

Before long we emerged at the old Army base and hiked up the hill to the mess hall and lunch.

In the afternoon we continued the canyon survey to the sea, this time accompanied by Alfred, the island German Shepherd. He is an amiable sort and spent most of his time being chased by ravens, and chasing them when they got too close.

After completing the canyon we began a stratigraphic column by measuring thicknesses of strata. We located 2 or 3 faults and traced these.

After dinner we had a few rounds of pool and took to writing notes. It was a beautiful warm clear day today and we could see Santa Barbara Island due east. It covers about 1 square mile.

A note of importance. We found out today that a well the navy intends to drill was located by use of an olive branch divining rod. One of the sailors sagely remarked on the fact that the navy which sponsored this olive branch geology also sponsored guided missile research on the same island. Bob thinks the best they can get is salt water.

September 9, 1950

San Nicolas Island, Ventura County, California

This morning we were driven over the ridge and down the southwest slope on a very steep road (41% in one spot) to the beach. The chief let us off there with 2 dogs, Ginger (a little cocker spaniel) and the German shepherd.

Along the beach were 2 or 3 big middens, 1 of which had a few human limb and rib bones scattered through it. This midden stands about 50 ft. high, a little above the high tide line. I caught 2 *Xantusia riversiana* under the remains of an old ship at high tide line. Bob was working on a stratigraphic column so we hiked upstream measuring the thickness of beds as we went. He took numerous dips and strikes and some samples.

We noted several faults running along the trend of the island and at right angles to the long axis of the island.

The high point of the anticline (structural divide) is skewed way toward the southwest, thus the slopes are steeper on that side. In cross section it seems to be something like this (drawing).

The stream channels of the southwest side have dissected through the structural divide all along the ridge.

Finally we emerged onto the high plateau at noon. The dogs had preceded us. We found a midden at 875 ft. approximately. I also took 2 *Xantusia* near this elevation thus establishing their presence on all levels with reasonable assurance. We hitched a ride back for lunch.

After lunch we rode back up Jackson Hill and walked southeastward along the ridge spotting in points and checking the exposures as we went. Near the southeast end iceplant becomes much more abundant and we noted a few opuntias of the staghorn type.

At the southeast end a sand spit juts out into the ocean a considerable distance. It was dotted with black objects that I suspect were sea lions. 4 fishing boats were moored to the west of the spit.

We visited an old cabin perched on the cliff (I caught 2 more *Xantusia*) and we hit out for the airfield in order to get a ride in for dinner. We walked like demons, making well over a mile in 20 minutes. All the radios were going in the control tower but no one was on watch. We phoned in to save a couple of diners and sat down to wait when the chief drove up. He had missed us at dinner and drove out to find us. We appreciably hopped in and got some chow. Tomorrow we work the beach from the spit to the radio towers.

Weather has been warm, cloudy, and windy in the afternoon.

September 10, 1950

San Nicolas Island, Ventura County, California

After breakfast the Chief (Haney) drove us toward the southeast end of the island and let us off at the end of the airstrip. We had Al, the German shepherd, along. I was carrying 2 lunches and other miscellaneous articles in my pack.

Bob wanted to establish a stratigraphic column of this end of the island. It is the top of the column and contains the youngest rocks. After setting another tower (Spur) we hiked down a deep canyon toward the southeast shore. It cut down through a section of massive sandstones and shales. Opuntias (both beavertail and staghorn) were fairly common as was a yellow composite with thick notched leaves. Fox tracks were common but we saw none. Several times we saw a large species of wren (about 2/3 the size of a cactus wren) with a black line over its eye, a grey breast with vague dark lines on the throat, buffy underparts, and brown wings and tail. Its bill is quite long.

Toward the bottom of the canyon we located a rather large fault (throw of over 100 ft.). Bob took a picture and we continued on toward the beach. At the beach we passed alongside a fair-sized cormorant rookery. There were at least 200 or 300 birds standing on the rocks. They seemed to be mostly Brandt's cormorants though I saw some individuals that looked like double crested cormorants. It is amazing how long it takes them to gain enough momentum for flight. They waddled in a continuous stream off the end of a 15 or 20 foot cliff and flopped onto the sand or into the surf without being able to attain flying speed. I frightened one old double crested cormorant off a higher perch (about 30 ft. or so) and he was just able to come out of his dive in flight. A few gulls were associated with the flock. The soil of the rookery was soft to walk on because of the accumulated guano.

We followed the beach northwestward noting the structure as we went. I caught 4 *Xantusia* under old boards just above the high tide line in *Salicornia* and grass. It was quite a fight to get them before Al did as he had his head under every board looking for mice.

We passed the old landing and beach where supplies for the island used to be landed.

Shortly we set up a marker at BM43 (Isle) and ate our lunch. Al got his share by hanging over our shoulders. We hiked on along the beach passing along where the sandstone dipped directly into the sea. We passed a battery driven lighthouse and came to a sandy area. In one place a fence had been buried about 3 feet over the top wire by southeast moving sand.

Bob decided to make a vertical section so we cut up across the terraces, up a steep little canyon, over more terraces, and out right near the BOQ.

After dinner I obtained a battle light and Bob and I went on a short jaunt to the local junk pile in an attempt to find something out about the activity period of *Xantusia*. It was about 17 deg. C. and we failed to see any lizards.

The day has been mostly cloudy and cool. The wind has not been bad however.

September 11, 1950

San Nicolas Island, Ventura County, California

After our 7:00 AM breakfast we drove up on top of the island and out toward the west end. Bob and I and Al started down the slope toward the southwest coast. The terrain is exceedingly barren and "fields" of calcified roots protrude from the soft rock in places. Wind erosion has created some rather fantastic effects on this barren rock.

The wind was blowing and it was cold at that early hour. I was glad to find shelter at times when Bob was taking dips and strikes of the beds.

We climbed over a precipitous slope and down onto the sea terrace below. The west end is exceedingly windswept and is covered with hummock sand anchored chiefly by a caulescent composite with numerous burred seeds.

The ravens performed acrobatics for us. They would glide along and suddenly fold their wings and go into a free fall. After perhaps 30 feet they would roll out of the dive by spreading their wings, usually after rolling completely over once.

We passed numerous exploded and unexploded shells and rockets, probably fired during practice invasions.

Up toward Land's End we could see and hear the seals (sea lions) barking. There must have been a tremendous number.

We hiked along the coast, Bob taking note of the geologic column and I just looking around. At one little cove we came upon about 12 sea elephants hauled out on the sand. They were nearly all piled together---young bulls and female and young animals. They are not particularly easy to disturb.

I got within 40 feet or so before they began to retreat for water. Their use of the hind legs for terrestrial locomotion is very limited. These limbs are highly modified into 4 flippers, each pair joined at the base. The front feet are broad but have normal toes and claws. The animals are very adept at scratching with these claws. In retreating the animals go backwards by hunching along on their bellies, thus maintaining a view of the intruder at all times. They are very fat and shake like jelly when they move. Bob describes them as looking like somebody tied up in a sack, which they do. They have the normal vibrissae on their upper lips and also large patches over each eye, directed backwards.

One small individual was too sleepy to run away. He yawned about the whole thing until I approached within 3 ft. or so and then he raised up, opened his mouth and hissed.

The sub-adult males were just developing the nasal trunk but were huge. They swam along pushing their huge head out of water every once in a while. On down the beach a short distance we came to a group of about 200 sea lions sitting on the beach. They are quite wary and rushed into the sea as we approached. Al was scared and retreated to the sand dunes above the beach when the sea lions started barking.

Some of the old males were reluctant to leave as the young and females plunged into the surf. They turned and barked madly at us as we approached but gave way when we were 35 yards or so away. The whole lot of them stayed among the breakers or just beyond, barking. The din was terrific. We could hardly hear ourselves talk.

After retrieving Al we continued on down the beach and ate lunch. Al left us and walked inland on a straight course, as if with a place in mind, after eating his share of the lunch. We noted a green area up the canyon and it turned out to be a spring. Al was there getting a drink when I arrived.

The spring occupies the mouth of a canyon and supports a patch of salt grass about 100 ft. in diameter. In one place, near the base of a hill on the north side, is a small patch of rushes growing from mucky soil and water. A small flow of brackish, though potable, water flows down the rock canyon bottom at the rate of perhaps 3 gallons per minute. The spring is along a fault line.

Shortly we turned inland and hiked toward the ridge. After 30 minutes or so we came to the top of a ridge and to our surprise saw a huge sand dune lying in the bottom of an amphitheater-like valley. The dune is about 100 ft. high and perhaps 500 ft. long. It is

surrounded by 600 foot walls of greyish-blue shale and yellow-brown sandstones. The sand blows over the crest from the west end of the island and settles in the valley to form the dune.

On the way up we saw a feral cat streak by. They are apparently well established on the island. I have seen one dead animal and found a skull.

We reached the top at the radar station. Al left us and we went out locating points (benchmarks, etc.) The wind was very strong and made sight taking very difficult. About 4:30 PM we got a ride and cleaned up for dinner. A couple of pool games and notes have taken the rest of the time. I am going to take a shower and hit the sack.

September 12, 1950

San Nicolas Island, Ventura County, California

This morning we drove out toward the west end of the island and took a road to Tule Creek and 1,000 Springs. We got out at Tule Creek pumping station and began fixing in various benchmarks.

Tule Creek is a small stream of water which has been dammed in one place. The water is greenish and has a distinct odor.

It is quite potable and is part of the water used to supply the base. A large type of coarse grass with big, puff-like seed clusters, resembling a small bullrush chokes the stream bottom. About 200 yards southeast of the north theodolite near the edge of a terrace a little below the theodolite, we came across a midden sprinkled with human bones. There were 2 femurs and other sundry items. Some excavation had been made but we left it untouched. There were also metates (2) on the mound as well as considerable shell material.

We hiked southeastward along the 300 ft. terrace. In 1 spot near a marker called "Canyon" we could see Corral Harbor up the coast a ways. It is a small embayment (100 ft. long) limited seaward by a ledge of sandstone broken in the middle to form a narrow entrance. Bob says the water is 8 feet deep. It has been used for small boats.

I wanted to collect *Xantusia* at an old army camp near the shore so we descended the mountain on the way back. I went down a very narrow steep canyon. In places I had to descend about 20 feet on nearly vertical rock walls—finally emerging at the camp. Bob was not far behind so I started turning boards and caught *Xantusia*. I waited a while and finally went back up the canyon in search of Bob.

As he was not in the canyon I hiked on to the B.O.Q. and he was there. He had come down a hill farther on—in plain sight—and assuming logically that I had seen him he went on in.

At lunch I learned that Mr. Thomas had seen a raven land (at Tule Spring) and catch a lizard (*Xantusia*) and fly off. This happened just after we left the spring. The lizard must be essentially diurnal as it is nearly always too cold for it to be active at night.

The scarcity of flying insects on the island is remarkable. Flies (not common) and 1 beetle have been all I have noticed. The insect fauna in protected situations is considerable however there are several types of beetles, silverfish, springtails, and among the non-insects spiders and sow bugs in abundance.

Apparently the constant winds, lack of cover, and small size of the island make it impossible for all but strong fliers to establish on the island.

I am perplexed at what an Indian would find to grind in his metate on this island. The metates are common enough but seeds or other grindable materials would seem to be scarce or non-existent. Perhaps they ground dried or cooked shellfish or some similar item.

I had intended to return to the army camp after dinner but a long afternoon hike along the crest of the island and a cold and strong wind changed my find in favor of pool and the sack.

November 27, 1950

San Felipe Bay, Baja California, Mexico

K. S. Norris and C. Lunbaugh[?]

[Drawing of cling fish]. Eyes: pupil black with small gold rims, iris light gray with horizontal black bar through pupil. Olivaceous bars radiating from eye.

Dorsal surface: very fine diagonal light colored (bluish tinge) barring irregular on head, complete on body. Alternate bars tan orange with olivaceous borders. Wide, dark bars along back—3, starting at pectoral, last at beginning of dorsal. Black spot cut by a light bar at base of pectoral.

Dorsal to spot a smaller orange spot. Directly posterior a larger olive green spot (separated from orange spot by a blue bar). Tip of caudal orangish. Venter olivaceous.

January 14, 1951

Yuma Mesa, 14 miles E. of Yuma, Yuma County, Arizona

In spite of a week's work gathering gear together, preparing and packing, we spent several hours completing these things before leaving on our trip.

Our trip is to last about 25 days and is to take us to Mazatlan, Siinaloa, Mexico.

The trip sponsored by Boyd Walker and UCLA is to collect fishes from the gulf, chiefly at Mazatlan. The party consists of Boyd, George Bartholomew (doing photography), Connie Limbaugh (diving), Art Flechsig (Boyd's assistant), George Barlow (general slave boy and seine puller), and myself (likewise).

Our gear includes such items as 2 trucks (one Dodge power wagon and a Dodge $\frac{3}{4}$ ton stake truck), 2 boats and motors, various seines, trammel nets, gill nets, trawls, fish poison, camping gear, cameras, etc.

I had breathed in some fish poison and was feeling rather poorly so I spent most of the time sleeping.

About 3 PM we finally left, saying our goodbyes to Dave Joseph and Boyd's family.

After an uneventful drive we camped on an emergency air strip on the Yuma Mesa.

January 15, 1951

Querobabari? Rd., Sonora, Mexico

Most of today was engaged in driving through Arizona, without particular event. While Bart was driving the stake truck near Tucson, he started to pass another car just as

a new DeSoto started to pass him. The DeSoto was forced over a rather steep embankment. Luckily it did not upset. We helped push him back on the road and continued to Tucson. Here we loaded up with good Tucson water and gas. I phoned Chuck and we continued to the border. The Santa Rita Mts. were snow covered and the hills around Nogales had a crust of snow among the oaks on north facing slopes.

The passage at the border was as usual except that the "armshaw" [?] rates had gone up along with auto insurance. To avoid a tedious inspection we were obliged to pay 2\$ American per car instead of the usual dollar. Insurance cost us 30\$ for 2 cars and a trailer which is about twice as high as before.

We drove on until well after midnight and camped in mesquite and palo verde. The air was thankfully much warmer than at Nogales, even though we did have a light frost.

January 16, 1951

El Miramar Beach, Bocochibampo Bay, Sonora, Mexico

I had a rather sad night as my stomach was giving me a bad time so most of my day was spent sleeping in the rear of the power wagon.

We reached Bocochibampo in the afternoon. I was to drive to Guaymas for bread while the other poisoned the lagoon. I succeeded in buying the bread at Bocochibampo so I was able to help with the catch. It was a huge one. Fish were coming up everywhere. We got 52 species at least. There were literally hundreds of young snappers (Lutianidae). Among others we took *Antennarius*, the toad fish, a peculiar lumpy little fellow with a bait antenna like an angler fish, and dozens of snake eels. These fish could be seen standing on the posterior 1/3 of their tail with the rest of the body arched and standing straight up in the water. They are very slippery and almost impossible to pick up by hand.

We made a few enemies by our poisoning. One fellow had been taking the Lutianids on flies and needless to say he was peeved to see so many of them dead. I can understand his point of view.

I had been feeling better and participated in the collection. After sorting fish and eating dinner we set out to seine Miramar Beach. It was 10:00 PM and we finished about 1:30 AM. Specimens were few in number but we got 45 different species. Among these were a sea horse and a trumpet fish (*Fistularia*). Back at camp we had a fish fry, coffee, and the sack.

January 17, 1951

Estero San Carlos, Sonora, Mexico

We worked on the huge collection of yesterday most of the morning and then packed and drove to San Carlos Estero, where we camped behind a high pebble beach. As it was fairly late Art and I took a boat up the Estero to seine for fish bait while the others made camp.

Art and I netted one large Eagle Ray and many small bass (*Paralabrax*). Evening fishing and night-light (with the Coleman lantern) netted a few fish. Late that morning we hit the hay.

January 18, 1951

Estero San Carlos, Sonora, Mexico

Connie, George and I set out this morning to do a deep water poisoning job. We picked a place where the rocky point dropped off into a 20 ft. deep pool. The poison was spread by Connie, who swam along (with the aqualung) with a 5 gallon can of mixed derris root (the consistency of thick mud).

Before long the fish began rising and we picked them up from the boat while one man worked the bottom with the diving rig. It was spectacular. Fish littered the bottom. We could take 5 or 6 out of every crevass. The bottom is not as beautiful as that off our coast. The algae is mostly a thin brownish mat on the rocks, though occasionally there are iridescent blue algae 3 or 4 inches across. We saw some sea fans, many urchins, and sea cucumbers, and matings of tunicates. Octopi and brittle stars were common. The octopi were good sources of fish. They are unaffected by the poison and scavenge the bottom. Some had 5 or 6 species in their grasp. The club-spined urchin lives in excavated holes in the rock walls and gobies (*Gobiosoma puncticulatum*) and Trypterygids were commonly found among its spines.

Some small morays were taken as were many Apogonids and Serranids (basses). Poison had been spread down to 35 ft. The water was quite cool (16 deg. C.) and we all had the shakes and shivers when we got out.

The trawling party returned after a rather unsuccessful attempt.

After lunch we did a similar poisoning job near the entrance to Estero San Carlos on Punta San Guellermo. Before many minutes had passed a big *Hoplopagrus*, a snapper, stranded along the shore. He weighed somewhere around 10 lbs. or so. Somewhat later, large snappers of another species (*Lutia*--?) began coming in. We caught about 10. Several other large fish were taken including another *Hoplopagrus*. Connie and George dove picking up many small fish.

Boyd and George and I filleted a large number of fish and we had a real fish fry, cooking a box full for lunch the next day. The fish was really delicious and we all stuffed ourselves, especially George who is emerging as a first class "garbage gut." He eats constantly and begs for more.

We hit the sack in a very cold night.

January 19, 1951

About 35 miles north of Agiabampo, Sonora, Mexico

Packing occupied most of the morning and then we drove on out to Guaymas, bought pan, wine, and gas. We had quite a conversation with Rene Minez at the Instituto de Pesca. He now has 3 biologists working for him—one in a town south of Mazatlan (Esquimapa). We learned that the road is paved from Mexico City to Mazatlan and about some of the coastline in Sinaloa.

The road is paved to the Rio Yaqui and for a short distance past Ciudad Obregon. Crossing the river this time was easy as the water was very low, almost low enough so we could use the ferry as a bridge. I could see all the spots in which Dick Zweifel, Bill Reeder, and I had been stuck this summer alongside the new road bed. This time we drove clear to Navajoa on the wide graded roadbed. The Rio Mayo was all but nonexistent, consisting of one small pool that came up to our hubs. Even though we used no pango to cross we had to pay a gaunt Mexican 1 peso for the privilege of splashing in his puddle.

After much indecision (which irked Bart no end) we received some instructions in a bar (plus some beer) on how to get to Mazatlan. The road laves the plaza, goes diagonally south 4 blocks, turns left to a brick wall at the edge of town, turned right 2 blocks, and then left down a wide road which becomes paved. At kilometer 9 (marked by a small cement post and sign saying Los Mochis) we turned left on a dirt road. [drawing]

A short distance farther we came to a banana truck stuck in a mudhole in the middle of a detour. A bridge had burned forcing traffic through the dips. After some work we hauled the truck out with the winch and a snatch block. It was quite a sight to see the big truck haul out of the huge hole it had made. Art, who was running the truck winch, was particularly satisfied at the sight. He twitched his moustache appreciatively.

We drove on over a two rut carretera to a junction with a wider graded road which we took, soon camping under mesquites and pitahaya cacti.

It was a cold night and my air mattress went flat so I am grounded for the trip I guess.

January 20, 1951

Agiabampo Bay, Sonora, Mexico

The area in which we had camped was a dense forest of *Pachycereus* cacti, a large multibranched species. There were occasional pitahaya cacti among the others. They can be told because they have larger and wider placed wrinkles [drawing]. Also the pitahaya has little balls of spines clustered at the top of the arms or littered around the base. These are fashioned into woman's dress combs by the Mexicans.

Tillandsia, the little epiphytic bromeliad was much in evidence on the tall branching ocotillo trees and on the *Pachycereus*. Mesquites and palo verdes were very common.

We passed through miles of this dense spring forest along a good dirt road. Bird life was becoming more common. Harris hawks and caracaras were seen perched on tall cacti. We saw Gambel's quail? running among the underbrush, cardinals, thrashers, and black vultures.

Boyd and I saw one beautiful little hummer colored with iridescent blue green feathers and a scarlet gorget.

Through a gap in this forest we could see a flat stretch of blue water and the tops of some date palms. The water was Agiabampo Bay and the palms were on the outskirts of Agiabampo. The town is a typical small village of several hundred people. Dogs, chickens, pigs, goats, horses, and cows roam everywhere. The houses are calsonined adobes or brick, built with roughly made Mexican bricks. Streets consist of the areas between houses. As usual, the church is the most ornate building in town. The inhabitants show a large percentage of Indian blood by their protruding cheek bones and dark skins.

We left the little town and drove northward to Agiabampo Bay, where we camped alongside a rather shallow lagoon and a white sand beach.

A party of people from Arizona and Oregon were camped along the beach. They were smoking *Scomberomorus*[?] *sierra*, the sierra. We had some and it was really delicious. The people were named Horst and were most pleasant.

We began our various fishing activities. Art and I took out the otter trawl and towed it up and down, hauling in great quantities of much and very few fish. We caught 2 species of puffers, a flat fish, and a goby.

Meanwhile the others were seining and poisoning a mangrove swamp.

After dinner everyone went to sleep but Boyd and I, who sat around the fire talking of this and that and writing notes. At about 11:00 PM we woke the others and went seining in the high tide.

We caught our first rooster fish and lookdowns. The roosterfish (*Nematistius*?) is a beautiful deep-bodied silvery fish with very elongate rays on the first dorsal fin. These are blue. [Drawing.]

I was really sleepy by the time we came in at 2:00 AM and went to sleep almost at once.

January 21, 1951

Topolobampo, Sinaloa, Mexico

We packed in the morning and left. While engaged in this many birds were seen. Forsters and Caspian terns were diving in the bay as were white pelicans. A pigeon hawk flew over.

Connie has gotten to the point where it is almost impossible to tell him from the Mexicans. He wears no shoes, does not shave, and wears baggy clothes and a straw sombrero. The only difference is that he is dirtier. He is one of the most casual people I have ever known. He never helps with the dishes, not because he is lazy but because he never does such things and doesn't think about them. Only about diving and women is he really critical. In Navajoa he and George had 2 cars of women talking to them shortly after we hit town. He is that kind.

The road leads up into some small rocky foothills vegetated by a deciduous short tree forest. Palo santo, the tree morning glory was very common and in bloom. Heilo trees were common (thick trunked trees with a yellowish paper thin peeling bark).

Shortly we dropped down into Las Palmas in the Rio Fuerte river valley. Las Palmas is a very dusty little village of clay and wattle shacks.

We crossed the Rio Fuerte over a small bridge, over which the boat trailer just passed. The stream was very small, about 8 ft. wide when flowing fast. The stream bed shows signs of holding a river 200 or 300 yards across during high water. The road leads directly into the old adobe and brick town of Charai across the Rio Fuerte.

Whereas stretches of untouched native vegetation are the rule in Sonora, above the river, fields of sugar cane cover huge areas below the Fuerte in Sinaloa. The country looks very productive.

In Charai we came to a paved road leading to Los Mochis, a sugar refining center. We had 2 Mexican kids about 16 riding on the truck. They were going to Mexico City from Mexicali. They had no money or baggage. One had an extra T shirt. They hadn't eaten for 2 days. They asked Connie to give them enough money for a haircut, so he offered to cut their hair with a pair of shears. They didn't take him up on it. Art gave them 5 pesos when they left us in Los Mochis. I wonder if they will make it, or what they will do if they get there.

Los Mochis is a thriving dirty farming town of several thousands of people. We stopped at the mercado to buy fruit and bread. The casual way in which wares are

displayed is interesting. Hats are sold from piles 4 or 5 feet high, as are baskets. Yardage and clothing are piled on benches or tables with no markings or reason to the arrangement. Fruits are heaped in great mounds. All the stores are little cubicles, open at the front or merely benches under canvas awnings in or along the street. Most everything is very dirty. The eating establishments are beyond belief in their kitchens. People are everywhere, men walking around hawking various items or carrying tables of bread on their heads, horsemen with chaps, carts loaded with nothing in particular and just people.

After buying manzanas, bananas, and oranges (we got the latter free from some fellows we had given gas to) we left for Topolobampo, through huge fields of sugar cane. The cane is apparently irrigated with sewage water as the canals leading through the fields smell terrible. The whole level valley is covered with large farms and looks very fertile.

About 12 miles south of Los Mochis we came up over a steep rocky hill to topolobampo. The town is composed of many shacks and rickety buildings clinging to the steep slopes of a rocky hill and point. Streets are precipitous and narrow, the whole place smells from the privys set on stilts over the lagoon. Juke boxes are turned on all the way and at night the town rocks with quartet music.

At the end of the point is the modern galvanized steel structure of the camarone cannery. Shrimps are the principle product and are caught both by large dredge (trawlers) and by a fleet of 180 dugout canoes[?] operating in the bay. The Mexicans using these canoas camp around the bay, catching the shrimp with throw nets (taraya). The shrimp are then picked up by barges and carried to the cannery.

We looked for a camp site and were forced to go out of town and camp on the baseball diamond. This diamond had been reclaimed from a mangrove swamp and was protected from high tide by a rock wall. It was a wet and dewy night. Art and I went up the hill and had a couple of beers with various Mexicans. One made friends with us. He was an herrera (blacksmith) and said repeatedly that he was "muy burro" and that we were "tres amigos". He bought us 3 beers.

After we had all gone to bed, Muy Burro (his name was Guillermo) came down the hill with 2 more beers and raced around the sleeping camp making loud noises pulling his revolver, and showing us how he would act if he were attacked. He affirmed that we were tres amigos and finally went away.

January 2, 1951

15 miles S. of Los Mochis, Sinaloa, Mexico

After our usual pancake breakfast we drove through town to a lagoon where we could launch the boats. Along the water's edge we were surprised to see dugout canoas being built. Each canoa was about 12 to 14 ft. long and made from a single tree trunk. Each one was about 2 ½ ft. deep and 1 ½ inches thick at the side. The bow and stem were thicker. Seats were inserted on little projections left by the workmen. The logs were alamo (sycamore) and some harder wood like mahogany (guinacastu). The latter type were considered much superior.

The original shaping was done at Sinaloa, inland from Topolobampo. No fire is used. Here at Topolobampo the workmen begin by using axes, taking off small slices. Then when the proper thickness is approached, adzes are used. The bottom is cut with the boat turned over. A hole drilled through the bottom serves as a thickness guide.

Connie and George and I set out to do a deep water poisoning. The bay is a large one. Rocky precipitous hills descend almost vertically into the bay in most places. Near the entrance there are extensive beaches. There are many inlets and islands. We took the boat a long way around the bay looking for a likely spot for poisoning and found none. Near the entrance we came upon a raft of white and brown pelicans. Later we saw some boobies, long billed curlew, oyster catchers, white ibis, scaup ducks, herons, and ibis. While poisoning fish frigate birds dove down, catching some of our fish. Some had white chins and breasts and others were black. We could see the red pouches on one male bird as he dove. Laughing gulls and Caspian terns were common over the bay.

We ate our lunch (what little Connie and I could wrest from George) while drifting with the outgoing tide. Before lunch was finished we had grounded on a sand bar and had to shove ourselves off.

We poisoned along a rocky shore with very little success. The water was very murky and our diving efforts were much hampered. The current had dispersed most of our poison before it had had time to take effect. The rocks under water were covered with a form of tunicate that extends a sort of translucent bell. White gorgonians were common and possessed a sting. Shell fragments formed a large part of the bottom where rocks were not present. A small labiid was seen swimming in schools. A pair of puffers (*Sphaeroides annulatus*) swam by.

I tried out George's rubber suit and had to have help getting out. Before George would help me he made me promise to give him my next morning's pancakes—what a bottomless pit.

The others had done some poisoning in a mangrove lagoon. They got few fish, mostly anchovies. When the dead fish drifted down the lagoon with the current they said the water was boiling with snappers taking the anchovies. They saw 2 bay porpoises (*Phocina*?) with their backs and blow holes out of water in one of these lagoons. The animals inch-wormed themselves rapidly into deeper water where the boats approached.

We packed and drove through town and up the hill. At night this ramshackle little cluster of huts rocks with music and the lights in variously shaped windows set on its steep slope overlooking a quiet moonlit bay, is quite impressive—if you are away from the smell.

At Los Mochis we were guided to the proper road (through the city dump) and camped shortly among opuntias and *Pachycereus* cacti.

January 23, 1951

Culiacau, Sinaloa, Mexico

The cactus forest was becoming more and more dense with underbrush as we drove south, over a fair road. I began to note papanche trees in numbers and tree morning glory (palo santo) formed an important component of the vegetation. We began to note patches of bromeliads on the ground under the taller plants. These agave-like plants were turning scarlet.

Before long we began to pass through wide fields of corn, all cut, and big cleared areas. The we passed through Guasave, a small town of thatched or tile roofs, ox carts, caballeros, etc. Passenger cars are becoming less in evidence.

Guasave was the first town we came to. It is strictly a farming town, set on the banks of a river, the Rio ? Southward we passed through fields and increasingly dense

thorn forest to Guamuchil, a somewhat larger town located on the Rio ? The river was crossed by driving over a stationary ferry (pango). Huge cottonwoods line the banks. Short tree forest elements are quite common. The vegetation is gradually grading away from thorn forest into a dense forest of 30-40 ft. trees.

Some fields have been hacked out of this dense dry leafless jungle. All the trees but the big *Pachycereus* cacti are cut down. These latter seem to die, whether because of exposure or having their roots plowed up, I do not know.

We saw our first magpie jay (Mexican jays?). A pair of these big beautiful birds flew out of the forest and over the road. They have great long blue tails, blue backs, a crest, a black face, and lighter underparts.

Shortly we came to Pericos, a small town shaded by beautiful big trees, some cottonwoods, other mimosaceous. There were many huge spreading fig trees with aerial roots hanging down from the limbs. Houses were woven work and mud with thick thatches of palm fronds. Some banana groves are dotted around the town.

We stopped to let the dust of the leading car settle when a boy on a bicycle informed us that we had a flat tire—which we did. We jacked up the car and started to take the wheel off when the brick under the jack broke and the axle fell. After borrowing home plate off the local baseball diamond as a prop a fellow came along with a large hydraulic jack and lifted up the car and changed the tire. Out of town we passed by a flock of 50+ green parrots—they were an iridescent blue-green on their backs.

The forest became denser and higher as we approached Culiacau. Bromeliads carpeted the forest floor.

It was dark when we arrived at Culiacau and we soon learned that the entire town (70,000) was out of gas. All their supply is shipped in and the train is 2 weeks overdue. Our tanks are too low to make Mazatlan so we will have to scrounge around tomorrow to get some.

We drove north of town and camped in the short tree forest.

January 24, 1951

Mazatlan, Sinaloa, Mexico

We arose amid screeching parrots and jays and drove into Culiacau. It was well into the afternoon when we got some black market gas under the nose of the Pemex gasoline distributor.

We drove on through the short tree forest, fording several streams including the San Lorenzo where the water reached nearly to the doors. These southern streams hold much more water than the ones further north.

It was dark when we came over a long detour through the forest and onto a paved road. A short while later we saw the lights of Mazatlan and entered town. It is a typical Mexican town with many ramshackle houses and some new modern ones, including a couple of modern hotels. The streets are narrow and of dirt, cobbles, and pavement. Nearly all the widows are barred. Some of the iron work is quite ornate. The streets are crowded with trucks, carretas, street merchants, and people. There are some street trees on side streets.

We finally found our way out of town to the Playa del Norte, a long clean beach north of town. We camped on the sand.

January 25, 1951

Mazatlan, Sinaloa, Mexico

When I woke up Connie was dangling a live sea snake over my sack. The snake had washed up on the beach. We packed up and drove on out the beach to a palm grove known as Cancaron Beach. We made camp in the grove (which has a caretaker and a barbed wire fence) for 30 pesos. The palms are loaded with cocoanuts. It is a very cool shady spot. Parrots are flying around us. There is a small restaurant on the beach and no people. We have plenty of room and will be largely free from worries about having gear stolen. We even have tables and chairs supplied us. This is the off season for beach life in Mazatlan. It is only about 75 or 80 deg. F and thus too cool for the inhabitants. The sea water is about 21 deg. C. or 68 deg. F. and wonderful for swimming.

Art and I were sent in town on various errands. We had the trucks greased and gassed up. Meanwhile Art and I climbed to the point on which the Colegio "El" Pacifico is located, where we looked for tidepools. On our way back we stopped in at one of the big hotels for a Coke. Brightly dressed musicians were playing and singing in the plaza. One of the instruments was a little deep-noted pot-bellied guitar called a Miguel. I would like to get one sometime.

We contacted Luis Pation[?], a spanish fellow who runs the marlin boats. He spends considerable time in the United States and speaks perfect English. He was quite helpful and let us sort over the catch of each boat. He also arranged for us to obtain fish from the shrimp boats. These boats are owned by Sr. Coppel. He is an excitable latin type and quite effusive. He does not instill confidence in one.

The boats come alongside a cement pier in the Astillero, a salt water lagoon. Business is booming for the sport fishing boats. They are booked solid till April.

We found that there are 3 shrimp packing plants in town and no commercial fishing except that from canoas. Most of this latter is done using tarayas (throw nets) and spears. The taraya is a cleverly designed net so made that when it sinks over fish and is pulled up by a central rope the leads are pulled in, leaving a bag around the bottom into which the fish swim [drawing].

Art and I went to the mercado to buy bananas and bread. It is a huge galvanized iron structure with all sorts of food piled on benches. All sorts of items are sold including clothing, baskets, etc.

We bought white gas in a drug store (after trying in a wine shop where the least we could buy was 15 gallons).

We returned to camp and found that the rest of the crew had made a fine deep water poisoning.

January 26, 1951

Camaron Beach, Sinaloa, Mexico

Bart and I got under way after much preparation and went over to Venados Island in the boat. The island is about 1 mile long and separated from Lobos Island on the south by a rocky isthmus. There are 2 small palm groves on the island, a well and a small spring (on the windward side). The summit is rocky and precipitous. Small, steep ravines support dense vegetation. Fig trees, a tree with yellow bignonia-like flowers and tangles of vines and small bushes make up the vegetation. There are rather extensive

grassy slopes, rocky tidal shelves, and one fine long sandy beach scattered with many sorts of shells.

We poisoned a high tide pool and picked up hundreds of small fishes of many colors. Some of the wrasses (Labridae) are especially beautiful. One is colored with longitudinal rainbow colors—pinks, yellow, green. Others have reticulations of bright emerald green.

We returned to camp and later Art and I went fishing and night lighting. With the Coleman we saw several kinds of fish including 7 *Stoasodion narinari*, a large ray with numerous white spots on its back and a long tail. We saw them flapping slowly through the light. Several flying fish were seen resting at the surface. The slightest disturbance and off they went in a trail of phosphorus. We caught several halfbeaks (*Hyporhanchus*[?] *unifasciatus*) in the dip nets, while they were floating at the surface. We also took some barracuda on hook and line and went back to camp at about 2:00 AM.

January 27, 1951

Camaron Beach, Sinaloa, Mexico

This day we all took the boats and equipment to the south tip of Lobos Island. Connie dove with a can of derris root in a little isolated cove, distributing the poison in throughout the water.

I put on a face plate and swim fins and swam around under water among the large rocks. All sorts of fish could be seen swimming among the rocks. The most common large fish was *Microspathodon*, a pomacentiid fish which is blue with long flowing white tipped fins.

A blenny, *Hepatoscartes*, was very common. He is an elongate fish with a steep forehead and pop eyes, colored brown and yellow. These fish sit on rocks propped up on their pelvic fins or wriggle over them. Small wrasses were very common, some are very brilliant. I picked up one little flabby fish that looked like an orange sack of jelly. It was a toad fish (*Antennarius*) and had algae growing on its back.

Gorgonian corals (sea fans) are common on the steep underwater cliffs. These delicate filamentous animal colonies are of several colors, reds, greens, yellows, and white. A large limpet the size of an abalone is quite common on the rocks. I pried off 2 and later cooked them. They tasted like an abalone only considerably stronger.

The diving was most interesting. Schools of a small herring were everywhere. Sergeant majors, a yellow and black barred perch-like fish were very common. We took several spotted moray eels and George saw a green-gray one about 6 feet in length.

At the entrance to the cove sierra (a spanish mackerel) and crevally were leaping and boiling the water as they took the small herring that drifted out. I caught one large sierra trolling through these fish.

We returned to camp very tired from diving.

Later Boyd wheedled Bart and I into going fishing with him. Boyd caught a 3 ½ ft. hammerhead shark (cornuda in Mexican, *Sphyrna tudes*). Shortly Bart became seasick and we started back. A thick fog began to close in around us and before long I lost sight of Orion which had been my landmark. We were in a dense fog shortly and could see only the wake of the boat and the rocket trails of phosphorescence left by large numbers of fish that were frightened by our oncoming boat. We had been out quite a ways and so we expected a long haul. It was longer than we thought. After a time I looked up and

saw stars—Orion was backwards and ahead of us we could see a high rock looming up vaguely through the fog.

Since we were camped on a flat beach with only a small headland we knew we had made a circle in the fog and were headed out to sea. We were looking at Lobos Island. We had apparently circled to the right though there was no real way of telling.

Boyd went close to shore and we crept along till we came to the beach of Venados Island (separated from Lobos by a small isthmus). We saw a small yellowish light gleaming on shore and a fire. It proved to be the camp of a Mexican fisherman Manuel Cardenas, and his young helper Raoul. Both were surprised to see us come out of the fog at this ungodly hour (1:00 AM). They agreed it was not sensible to try to go to shore until the fog lifted. Manuel assured us the fog would lift as soon as the breeze (brisa) came along. They were fishing with taraya nets and spears. They had some small fish and many sierra.

Boyd asked to go out with them to see how the throw net worked. Manuel would not go until it became clearer so we all gathered around the campfire beneath fig and palm trees. Large land hermit crabs were walking all around the area. Manuel called them "Chollolo".

Finally the fog began to lift and Boyd went out in the canoa with Manuel and Raoul. Bart and I talked for a while and then lay down by the glowing bed of coals. We were completely exhausted and dropped off into a sound sleep on the warm sand. We were awakened by Manuel about 3:00 AM and very reluctantly got up. After an extended series of halting Spanish sentences we hired Manuel to fish with us in the Astillero on Monday. He will meet us at Camaron. Bart and I were reluctant to leave our pleasant island and would willingly have spent the night by the fire.

We went through the surf, hauled the boat up and wearily hit the hay about 3:30 AM.

January 28, 1951

Camaron Beach, Sinaloa, Mexico

This being Sunday we packed up and left for Villa Union and the Rio Presidio to do some seining. Villa Union is about 15 miles southeast of Mazatlan on a good paved road. Just before we reached the river we cut westward on a 2 rut carretera to the village of Barrou. We passed through farm lands on a road bordered by many large broad leaf trees and numbers of smaller spiny ones.

Barrou is an adobe village clustered along a wide dirt street cluttered with the usual wagons, horses, and dogs.

We hired a boy to guide us to the river. Our first seining was done in the shallows. We caught several bagre (catfish). Seining some of the deeper holes yielded some gobies and much mud. We left with several kids hanging on the truck.

I spotted a large iguana (3 ½ ft.) (*Iguana iguana*) in a mesquite? I killed him with my shot pistol with excited Mexican children racing all around. This lizard is really quite remarkable. A row of very elongate scales run down the center of the back. The animal has a huge orange dewlap under its chin. The sides of the body are barred black and emerald green and the animal has a very long tail which is not readily dropped. I shot 2 more when the kids pointed them out. The animal is highly arboreal and climbs from tree to tree with much facility. They climb to the top branches and sun themselves. Their

green color makes them difficult to see. I saw one spiny tailed iguana (*Ctenosaura*) running through the bromeliads that covered the thorn forest floor.

We stopped at the river on the outskirts of Villa Union and seined. It was very mucky, stinking, and unpleasant. We were all glad to leave except Boyd who wanted more fish. We arrived home wet and dirty.

January 29, 1951

Camaron Beach, Sinaloa, Mexico

Promptly at 8:30 this morning Manuel Cardinez and his helper Raoul, appeared in camp all dressed up. We were nearly packed and left shortly for the Astillero at Mazatlan. At the boat landing Manuel rented a canoa and went to his house for a spear and taraya (throw net). We unloaded both of our boats (pangos). I set off with Manuel and Raoul in the dugout (made of gua wood, which looks a lot like mahogany). Raoul poled us out across the flats while Manuel threw the net.

The boats are long and narrow and tip easily from side to side but are apparently quite seaworthy as the Mexicans use them in rather rough weather on the open sea.

The taraya is thrown in a very particular manner. The center rope is coiled in the hand and several coils of the net. Then, one coil is thrown over the free elbow and the rest of the net is hung and taken out by throwing the leads backwards around his ankle [drawing]. The net is then thrown by whipping it sideways. The net spreads and falls as a circle of net with the leads on the outside. It is then pulled in slowly, keeping the leads on the bottom until the net is bunched and vertical and any fish therein are entangled in the net.

We caught very few fish by this method. I sat amidships on a few boards and asked questions. We saw many birds and Manuel knew the names of all of them. Ijereta-man of war bird, gavilan de la agua-osprey, alcatraz-pelican, garcita-heron, sopilote-vulture. Mangroves were called manglar.

Later we paddled to the beach where the others were seining and had them tow us up the estero to a place Manuel said was good for our chinchorra (bag seine).

We tried it and were rewarded with a good catch of many species. Manuel knew the names of all the species—even the ones that were hard for us to distinguish. He was really amazing. We followed his directions and were able to seine through rocks without getting hung up. He told us we would get the net full of mud (lodo) if we went out to the end of our seine ropes. We did and got a load of mud.

While rowing the boat along shore I saw a rooster fish chasing a 8 or 10 inch mullet which jumped repeatedly out of the water. The long dorsal fin of the rooster fish cut the water under the fish and finally the mullet quit jumping.

After a few more hauls we went in. We had taken 55 species. Back at camp we were glad to sit around a palm frond fire and watch the centroides scorpions running around.

January 30, 1951

Camaron Beach, Sinaloa, Mexico

This morning we planned to poison near the isthmus between Venados and Lobos Island. Harry Trevellet and his wife Polly asked to use our boat for a little trolling. We

towed one boat with the other. At the isthmus we unloaded, leaving our white surf boat for the Trevellets, who left around the point of the island.

Connie placed the poison in a semicircle along a rocky reef, to a depth of about 15 ft. A slight current caused the poison to drift somewhat but not enough to affect the potency greatly.

The fish began to splash at the surface and we got many good specimens. I used the diving rig last after most of the fish had been picked up and consequently got relatively little. With my very last breath I pursued a ray I had noticed swimming into a crevasse. I pried him out with the handle of my net and scooped him up and then popped to the surface 15 ft. above, gasping for air. The fish was a rare species (there are about 4 specimens known), *Urobatis concentricus*.

Art had been picking up floating fish in the boat and came in with a good series of fishes including a beautiful golden elongate blenny.

We returned to Camaron Beach and Art and I went to tow to pick up gas for the motor, bread, and bananas. The carnival was underway. This affair lasts for 4 days and consists of dancing, fireworks, much high pressure vending by streetside merchants, and considerable drinking—both soft and hard. The fireworks are shot up from several places in town including the plazas, apparently with no regard for where the burning remnants land. All sorts of huge bombs and star shell type displays were fired off. Many street bands walked among the crowds playing. The music was generally awful and I don't wonder. The musicians usually were forced to walk single file down jammed sidewalks, being jostled by dozens of people.

Everything stops for the carnival and we found it impossible to purchase gas from the pumps. Instead we had to buy a 15 gallon drum of white gas for about twice the normal price.

I had the pleasure of watching Art attempt to fade into the crowd. He likes nothing better than poking around Mexican towns, speaking to the natives and soaking up culture at every pore. He is a lot of fun to travel with therefore.

At this particular time he was leaning in a doorway, his straw sombrero tilted on his head, leisurely smoking a cigarette and watching the crowd pass, pleased to note that he was not recognised. The curious eye of a Mexican settling on him would have ruined it for him.

We returned to camp and I worked on fishes with Boyd.

February 4, 1951

Camaron Beach, Sinaloa, Mexico

Early in the morning we packed and drove about 4 miles north of camp to the edge of the beach. Here we loaded up the equipment on pack boards and began hiking through the beach sand. After about 200 yards of this we came to a large landlocked saline lagoon extending a mile or more inland. A high barrier beach blocks the lagoon from ingress by the sea. Only a high tide and storm waves would seem sufficient to flood the lagoon.

All sorts of birds were around the water or in it—8 or 10 blue herons, terns, pelicans, frigate birds, and many smaller shore birds were seen.

We seined the lagoon with the 100 ft. seine and common seine seines and caught many mullet, milkfish (*Chanos chanos*), halfbeaks, and gobies, and robalos.

The water was highly saline. I went swimming and was able to float with my knees, feet, and arms out of the water. I had convinced the rest of the crew it would be little work to carry the equipment in and out and in the course of this argument had promised to pack the 100 ft. seine in and out, if we would seine the lagoon.

The dry seine had been something of a load in the soft sand but the wet one full of sand and sticks was something else again. I made it but it was rough—when Art helped me out of the back board I about took off.

On our way back Connie caught an iguana (*Ctenosaura hemophila*). We planned to eat it that night as everyone wanted to taste the meat (which is very good).

Back at camp we ate lunch and left for the beach to do some daytime seining. Just north of Camaron Pt. we made several sets and took a good series of fishes. Boyd wanted to work the steep beach south of the point so I rowed the boat around and met the others on the beach. The surf was much higher on this unprotected beach and landings were much more difficult.

The first sets produced nothing spectacular so Connie suggested that we set the nets out farther which meant that we would have to wade out into the surf with the rope. Only one person could do this so the first 100 ft. or so were all pulled by 2 people. I took the first rope and got all wet so a couple of other times I did the same thing, going out to my neck—with Connie on the other rope.

We caught some 3 foot white sea bass and other species.

George, who had been protecting his dry T-shirt and hat was elected to take the boat rope on one haul. On the way out I was rowing and a wave broke under us. I was tossed into the bow and George into the stern, shirt still dry.

At the end of the set George was paying out the line when the end came up suddenly. He grabbed the line just as I gave a stroke to catch a wave and he flew out of the boat, did a complete twist and landed in the water—hat and all. Once wet George was in the water all the time—riding waves, hauling lines, and just horsing around.

I rowed back around the point against the wind while George swam.

Before dinner I started to clean the iguana. The knife slipped as I was slitting the tough skin and sliced into my middle finger about ½ way. I dropped the iguana, popped my finger in my mouth and began yelling for some bandage. Art fumbled around and finally produced a roll of unopened bandage.

He looked at it, rolled it around his hand, and finally deigned to open it. I was about ready to yank it out of his hand. Bart wrapped it up tight and I sat down.

Bart and I left after a few minutes for town as he thought I needed some stitches. I wouldn't have bothered but I agreed it needed sterilization as the blood supply to the tip had been badly restricted.

In town we picked up a policeman who showed us to the hospital. It was a large cement stockade-like building group with a barren dirt courtyard. I climbed the step to a door marked oficina and knocked. Finally a woman in a bathrobe appeared. With the aid of Bart and the dictionary I made it known I had cut my finger and wanted to have stitches taken. She said there was no doctor on duty and would be none till 8:00 AM next day. She said the attendant would take care of me, however and directed me to the end of the courtyard. We walked across in the company of a girl attendant who didn't look very clean.

Inside was a vault-like cement room with 3 single lightbulbs strung from the ceiling, a row of simple brass beds on either side of the room. These were occupied by all sorts of very sick-looking Mexicans who looked, in many cases, as if they had walked in and gotten into bed with no instructions. Hats hung on bed posts. The bedding consisted of a single sheet. We walked in through this room and into the operating room. If we hadn't walked through the ward and been introduced to the starkness of Mexican hospitals, we might have been visibly shocked by this operating room. In its center was a filthy operating table with no cloth cover, its paint chipping off. The room, about 10 ft. by 6 ft., sported a waste basket full of garbage. On one wall was a wash basin so dirty I would not have washed in it. Again, a single unshaded light hung from the high ceiling.

The girl started to sterilize her hands by gingerly pouring antiseptic over her fingertips, being careful not to wet her palms. She was being directed by a man whose glasses were so dirty I couldn't see his eyes. His clothes were in keeping with the rest of the atmosphere.

Bart and I asked for the doctor and when we were told he wouldn't be in, we left, my finger untouched thank goodness. It was quite a shocking experience to realize that this was the hospital for a city of 40,000 people—no doctor on duty during the carnival when dozens of emergencies must have arisen.

Bart and I drove up town looking for a doctor. He finally located the "Cruz Roja" (Red Cross) near Olas Altas.

It was a neat place dealing strictly with emergency cases, attended by a businesslike attendant and a clean nurse. He insisted my cut was "superficial" and needed no stitches. He sterilized it with merthiolate and sulfathiazole and then remarked that my 3rd finger needed bandaging too.

I looked and saw it had quite a gash too which no one had noticed. My middle finger had been numb through all this so the only thing I felt was the merthiolate on my 3rd finger. He taped the cut closed. At this time a grimy mechanic walked in holding the pan off of the ambulance to show me the injuries it had sustained. He was covered with grease and the pan was full of large holes.

We gave a donation to the Cruz Roja—they accept no pay—and started to leave when 2 men staggered in covered with blood and screaming incoherently. One had apparently grabbed the knife of an attacker. His hand was slit from wrist to little finger. I asked the attendant if it was superficial—he said no.

Back at camp I ate some belated dinner with Bart and we went out seining, I with my finger up in the air.

We hit the sack about 12:30 AM. My sleeping bag had been left open in all the excitement and was soaking wet with dew. In spite of this most uncomfortable bed and my hand I went to sleep.

February 5, 1951

Camaron Beach, Sinaloa, Mexico

Boyd, Connie, George, and I left camp to do a final poisoning near Creston Island. We left Art and Bart in camp to start packing.

We drove through town and out to the point where we selected an area of rocks and pools in the calm harbor

For a while it seemed that we wouldn't get much but then the species started coming in. Because of my finger I was forced to work the tide pools. Boyd, Connie, and George dove and really brought in the fish. We took 72 species—the largest list to date.

Back at camp we continued packing and prepared to leave in the morning.

February 6, 1951

North of Guaymuchie, Sinaloa, Mexico

After saying our goodbyes we left the palm grove and Camaron and drove to Mazatlan where I sent a belated telegram home. It was the first time I had been in town when the Post Office was open.

The ride to Culiacau[?] was uneventful except that we found our boat trailer slowly falling apart at the seams. We camped in a little clearing in the short tree forest north of Guamuchil. I built a nice crackling fire of palo santo limbs which we all enjoyed. This short tree forest is a fascinating place—full of birds and strange plants. I would like to spend a couple of weeks becoming familiar with it sometime.

February 7, 1951

South of Los Mochis, Sinaloa, Mexico

Today was another day of hard driving over the worst stretch of road we encountered on the trip. It was not bad but was washboardy. A passenger car could make it easily (in the dry season only). We camped in the cactus forest having watched the short tree forest change into thorn forest as we traveled along.

February 8, 1951

Estero San Carlos, Sonora, Mexico

A long day's drive brought us uneventfully to the old camp site before dark. I gathered up a lot of cactus wood—we had a nice fire. Boyd and I went fishing and in spite of a beautiful calm dark night and considerable diligence on our part, we caught one shark (*Mistiles*). We crawled into bed very late.

February 9, 1951

About 30 miles S. of Santa Ana, Sonora, Mexico

First thing this morning we poisoned a deep reef west of the entrance of San Carlos Lagoon. The results, while good, didn't seem like much after our 72 species collection at Mazatlan.

Bart had his first success in using the aqua lung and was completely elated at this success.

We had the help of 6 skin divers from UCLA who were down for the sport. One was a fellow who had been in one of the lab sections I had taught.

March 15, 1951

Enroute to Guadalupe Island, Baja California, Mexico

The present trip is a combined venture of the Marine Life Program and the Division of Marine Vertebrates, Scripps Institution of Oceanography. We are to spend 15 days trawling in Mexican waters. Both deep and shallow sets will be employed. The

deep sets will be set up to 700 meters and will be to collect deep sea bathypelagic animals and to investigate the deep scattering layer. The shallow hauls are directed primarily at sardine research, collecting larvae and eggs.

The nets are a 10 ft. beam trawl (designed especially for deep water work) which is the most effective net yet developed for this sort of work.

This net will also be used for shallower hauls. In addition a meter net for collecting plankton samples. Bathythermograph records will be taken and a program of recording whale noises and smells is underway, using sonar gear and a chemical recording machine.

The ship is the Scripps Vessel, the *Paolina-T*, an 80 ft. converted trawler.

Scientific members are myself (in charge of specimens and records); Bob Wisner, in charge of schedules and the whale program; Lon Kidd, in charge of nets and other gear; Scotty Walker, in charge of meter net hauls and plankton samples; and C. Wilson sonarman and radioman.

A crew of 7, headed by Captain Larry Davis makes up the ship's complement.

At 10:00 AM we lifted the hausers and slid away from Naval Electronics pier. The day was beautiful—clear, calm, and warm. Even when we cleared Pt. Loma the swell was slight. We went straight for Los Coronados Islands and passed between North and Middle Islands.

The thermatow was put over the side. This device records on a graph a constant surface temperature record. It will be in use for the duration of the trip except while we are at anchor.

As the Coronados grew dim on the horizon we came upon our first albatross (black-footed albatross). The grace of these great oceanic birds never fails to impress me.

I stretched out on the fantail and rested in the sun. Shortly I noticed the ship stop and swing around. When I got up to investigate I saw 2 large sei whales about 50 yards to starboard. They were swimming slowly along, rising up and sliding beneath the surface. First the snout comes to the surface. The snout-valve opens and the beast "blows" a misty spout into the air and then the animal slides up, revealing the small dorsal fin. The tail flukes can be seen only when the animal sounds [drawing].

The whale is dark grey above and light underneath. Twice female grey whales were seen with calves. About 3 mi. south of Pt. Loma grey whales were seen to turn on their side putting a huge flipper into the air between our ship and the calves. Whether this behavior allows the young one to nurse or is for its protection is not clear. All the whales were going northward.

I climbed the crow's nest and was able to see any invertebrates floating in the clear water—jellyfish, salps (borderline vertebrates), and some sort of large coiled egg case. These were 6 in. or so across and a translucent pink color.

At 5:00 PM we finally got the big net over the side and had the satisfaction of seeing it sink, unfouled, into the clear blue water. 1800 miles of cable were let out which will place the net about 375 meters below the surface.

The seas became rougher as the wind picked up. We began to get a small scale dose of the *Paolina T*'s rolling capacity. At about 9:30 we decided to haul in the trawl. Bringing up the net was much more laborious than . . .

After nearly an hour we called out "sight!" as the swivel hove in view.

The net came over the counter and I could see some of the deep sea creatures clinging to the mesh. The bag was filled with salps, a very primitive chordate. It looks like a big blob of jelly with a hard shell-like structure in the center.

We piled the contents into trays and began sorting. There were several different kinds of fishes—deep sea smelt (*Leuroglossus*), a little lumpy angler fish that was all head, long attenuate snipe eels with peculiar spreading beaks, little lantern fishes, and the bizarre hatchet fish [drawing]. All had their complement of light organs—all directed downward.

The roll of the ship swashed the contents of the tray back and forth in front of my eyes as we sorted—mal de mar began to set in and I finished the job in a rather sorry state. I stood up in the port passage way in the stiff breeze until I felt a little better—then I crawled into my sack without bothering to make it up.

March 16, 1951

Melpomene Cove, Guadalupe Island, Baja California, Mexico

I woke up this morning feeling much improved. Bob Wisner decided not to put the net over on account of the wind and sea.

Early in the afternoon we sighted Guadalupe Island. The crest of the island was hidden in fog. The lower portions looked very precipitous. Sharp pinnacles stand up from the almost vertical cliffs.

As we came closer the variegated layers of lava forming the cliffs could be seen. We cruised down the east side in a fresh breeze. Finally we came into the lee and the sea became calmer. On the crest of the ridge there are several patches of pine forest to be seen. The trees look scattered for the most part though we did see one rather dense stand. In the mouth of a canyon below one of these groves we noted a patch of green vegetation.

I looked through the field glasses and noted 2 houses—both small white buildings just above the seashore, among this vegetation. The only approach to them would be the sea and then over a rough surf and rocky beach.

Toward the south the island becomes less precipitous, consisting of a series of rugged lava flows sloping off into the sea. Nowhere are beaches of sand to be found. The best landings are over large cobbles.

As we approached Melpomene Cove at the south end of the island, cinder cones became a prominent part of the sky line. The small vegetation is very sparse and mostly confined to the canyons as far as we could tell from the sea.

Melpomene Cove is flanked by high basaltic cliffs and precipitous tufa slopes. After some indecision and searching we decided to anchor in the cove in spite of the breeze flowing offshore. It was the only place we could find offering water as shallow as 10 fathoms a respectable distance offshore. The west limb of the cove is limited by three islands—all precipitous.

During the day we had seen some interesting birds—beautiful young Bonaparte's gulls, black-footed albatrosses flying close to shore, and Xantu's murrelets. This latter bird may have been a Cassin's murrelet as our observations were from some distance.

Scotty Walker and I decided to try to reach one of the islands. I wanted to get ashore to look for lizards. In the '80s a lizard was reported from Guadalupe Island but subsequent parties have failed to find any reptiles. Slevin attributes their disappearance

to feral cats, which run wild over the main island. As they are not present, the lizard, I think, may survive on these isolated islands.

After much trouble we got the 16 horse power motor mounted on the little skiff. The skiff is very light, a 5 horse motor would be quite large enough but we had to use the large one. I was unable to increase the speed above starting speed to slow speed without seriously endangering the boat in the windy sea. We cruised westward toward the island and could see that its eastern face (the one nearest shore) was one large cliff of reddish smooth rock which had spalled off huge crescents in places, leaving overhangs. It rises straight out of the water.

We noted that the point of Guadalupe nearest this island supported a small cluster of houses. I turned the boat towards them and we saw some men in denims walking between the shacks—there were no boats visible. An anemometer spun on top of one of the houses. All were built on a little point of land entirely composed of basaltic boulders. A crude pier of stones protrudes a few feet into the water. We were picked up by the surge and deposited rather roughly on shore amidst rocks and Mexicans.

The inhabitants told me that there were 3 men here acting as weathermen and the others were fishermen (about 25 in all). One fellow offered to get us all the abalone we could use. He said black abalones were common around the shore and the yellow ones in 1 to 3 meters of water. I was told the blue fin tuna were biting at night when the moon was not out. No one remembered Dr. Hubbs, who was here a year ago.

As it was getting dark Scotty and I decided to go back to the *Paolina-T*. I could see that the west slopes of the small island were even more precipitous than the east—being a huge 200-250 ft. cliff rising straight out of the sea almost to the crest of the island. A lizard would have a sad time trying to climb it.

Going with the wind we made good time and were soon hoisted aboard—after another bout with the heavy motor—this time to get it off and aboard.

At night we lowered a 250 watt lamp and reflector over the side and collected a few blenny larvae, some isopods, a squid, and a series of little crabs with gleaming greenish eyes. Later we took a few horse mackerel with hook and line.

Notes and general bull sessions occupied the rest of the evening.

March 17, 1951

At sea enroute to Punta Abreojos, Baja California, Mexico

Before I got up I could feel the ship get underway and see the volcanic cliffs of the cove slipping past. We set out to sea along the lee east side of the island and set the trawl down. Our first set was made in 600 fathoms of water with the net down 200 fathoms.

After a 2 hour haul through the grey sea we hauled the net up and over the counter. There was relatively little in it. A few deep sea fishes (*Vinciguerria*) and many interesting invertebrates. Several *Phyllosome* larvae (the pelagic larva of the spiny lobster) were taken. These creatures are virtually invisible in the water as they are completely transparent. The main body is round and thin like a circle of thin celluloid, with a small jointed tail appended. The eyes are on long stalks and very long crystalline legs protrude. The whole beast is possibly 2 ½ in. long.

We suspected that our haul had not been deep enough as the water is amazingly clear, so our next haul was taken in 1,000 fathoms with the net at 500 ft. By the time the end of the haul had been reached we were in a great rolling sea—huge ground swell

coming in from the open ocean unchecked by the island. We took many fishes but nearly all were badly battered, apparently by the sides of the net bag rubbing together over the catch. One 8 in. fish with great teeth and a long barbel protruding from its chin was taken. The barbel was tipped by a bulbous purple light organ. Many battered lantern fishes (Myctophidae) and small stomatoid[?] fishes were captured.

We turned the little rolling ship and began to run southward with the swell and wind. The ship rides much more comfortably this way.

Lew and Bob and I installed a 5 gallon can in the end of the net, its bottom perforated by holes. This improved our catch a great deal, though most of the fishes slipped down around the outside of the can, under the mesh.

Lew and I put the net down, taking turns with Knox, the winch operator. We lowered it until 3,500 meters of cable were out, or converted to depth about 600 fathoms or so. It was past 1:00 AM and we all willingly secured and hit the sack while the *Paolina* chugged on at 4 knots.

By the time I got up in the morning the net was on its way up. It contained relatively few animals. Probably the fish move surfaceward at night and most of our fishing was done in sterile water.

The tedium of shipboard life is beginning to set in. The lack of space is acute. All sorts of gear littler the deck space. I notice the lack of exercise greatly.

To stand up on the bridge of this little ship, feeling the slight swell cause her to roll, and seeing nothing but limitless ocean, makes me wonder what we are doing out here—especially when we creep along under 4 knots with the net in tow. It seems a little presumptuous somehow. We haven't passed a ship since leaving the vicinity of Los Coronados Islands.

Routine is quite lax though adequate, compared to that I used to experience in the Navy. At night the ship is in automatic pilot (it is always in automatic pilot except when we anchor) and the anchor watch consists of one man who, like as not, spends his watch drinking coffee in the galley or reading Thorn Smith novels. When we are towing, flood lights are rigged to the booms aft and light up the whole stern of the ship.

We are not maneuverable with 1,000 meters or so of cable and a net astern and we travel very slowly. One can watch the long ocean rollers sweep past and look down the huge wave troughs.

I am reminded of how easy it is for chiefs in the Navy or on board this vessel to be fat. Virtually no exercise and 3 huge meals a day. Today we had rolled flank steak for lunch (dinner) and a half chicken fried for dinner (supper) with mashed potatoes, 2 vegetables, and chocolate cake, and milk. Thanks to Dramamine I eat heartily.

We made 3 more hauls today and got a good many deep sea fishes—chiefly lantern fishes and *Cyclothone*. We got a few good specimens of large species, one with a large barbel on its chin [drawing].

The sun was shining brightly and we were able to lie on deck while the net was being towed.

March 19, 1951

Enroute to Punta Abreojos, Baja California, Mexico

Another day of towing! Waiting between hauls and while the net is down—reading and sunbathing. Two of the fellows—Mac and Oolie, went over the side and swam alongside and used their paddleboard.

Scotty Walker spotted a sunfish (*Mola mola*). This peculiar fish swims along with its long sharklike dorsal fin out of water, flapping lazily from side to side. Sometimes the fish swims upright and sometimes on its side. The fish swam amongst 4 blackfooted albatrosses who were sitting in our wake. The birds took little notice of the fish (about 10 lbs. or so) at first and then swam over to it, peering at it from a distance of a few inches. Possibly the birds were searching for parasites to pick off.

Scotty and I fed the albatrosses bread soaked in cooking oil. Four of them came up and at once established a definite peck order—one large individual whistling painfully when any of the others got a piece of bread. He swam and ran over the water at these other birds with his beak open, screaming at the injustice that had been done him. The least aggressive bird sat 100 yards back in the wake and dove for pieces that floated his way.

The way these birds run and slide across the water is remarkable. They actually run, while using their wings and —plane to a halt by raising their toes and sliding over the water until momentum is lost and their feet sink. They always seem to run when taking off the water.

We made one long deep haul (about 1,000 fathoms) and a short 50 fathom haul. The former was relatively unproductive, possibly indicating that what we did catch was taken on the way up or down. The shallow haul failed to produce any eels or memlamphids and contained many lantern fishes. It seems evident that in the daytime we take more fish of more different kinds at 250-500 fathoms than in other layers. The 5 fathoms haul was taken after darkness and possibly represents a differential vertical movement of bathypelagic species—the lantern fishes moving close to the surface while the others remain below.

Hatchet fishes seem to be rather uniformly at fairly shallow depth—200 fathoms or so—and possibly as their structure suggests, live just at the lower limits of the photic or lighted zone. Their eyes are directed upward as if to aid in capturing food by use of shadows cast by light from above. Their photophores shine downward.

It is now 11:00 PM and we have secured the trawl and are proceeding at 8.5 knots to rendezvous with the *Horizon* for a combined operation.

March 20, 1951

Enroute to Punta Abreojos, Baja California, Mexico

I slept till about 8:00 AM as there was no trawl down overnight. As soon as we got near our rendezvous point with the *Horizon* we put the net over the side and began towing. We have been towing a temperature device (a thermatow) behind the ship that gives us a constant graph of ocean temperature. It read 17.4 degrees so I decided to go swimming over the side. Oolie and I lowered a rope from a davit and he climbed up the Jacob's ladder leading to the crow's nest and jumped off from about 30 feet. He made a grand splash in the blue water. The water is so blue that it looks opaque unless something floats by under water and then it can be seen at 40 feet.

I dove off the railing. Before long we had enticed Scotty and Lew in the water. Lew made the mistake of diving off the stern railing. He had a little trouble catching up with the slowly moving ship.

A pair of red billed tropic birds flew over. These pretty white birds have a long pair of streaming tail feathers and a bright red bill. They constantly flap their wings in flight and never seem to glide. Their wingbeat is quite rapid.

Our evening hauls were quite successful as we brought in an eel and a peculiar fish with a hooked beak which we hadn't seen before.

March 21, 1951

Enroute to Punta Abreojos, Baja California, Mexico

We were routed out of the sack at about 4:00 AM when the *Horizon* hove into view. Scotty put out a plankton net while we waited for the *Horizon* to put down her deep cast (Nausen bottles and thermometers). About 5:00 AM we put the net over the side and lowered it away—to 4,500 meters of cable out—or a depth of about 1,040 fathoms.

About 11:30 AM we began hauling in and 4 hours later the net was on deck with some very interesting fish—a hake (*Merluccius*), several Melamphids—a fish with a peculiar knobby bony head, black from snout to tail and a grenadier. This latter fish is a surprising creature with a lumpy body tapering to a long rat tail. These fishes occur over the whole world in deep water I believe.

The tow took 4 hours coming in and in the meantime we did a little swimming over the side.

In the evening we lay to while Lew and Bob ran some tests on net floats, testing their breaking strength by lowering them to great depths and recording their explosion (implosion might be a better word) on a hydrophone.

This work relates to some deep water hydrographic sampling gear that is being developed. The floats are to be broken when the gear reaches bottom and the noise picked up—thus the operator can stop letting out cable at the right time.

During all this I lowered a light and Scotty and I dip netted saury larvae from the water. We also collected a number of swimming crabs for bait. These pelagic crabs are quite interesting animals. They swim by a combined action of flipping their tails and bringing all their legs in at once. All the appendages are fringed with filaments, which probably aid in flotation. The crabs are orange red and very numerous in the water at night, swimming at the surface and as far down as you can see.

We put the net down as deep as we thought safe (5,040 meters) and repaired to the gallery to discuss this and that and write notes.

March 22, 1951

Enroute to Punta Abreojos, Baja California, Mexico

Spent the day and evening towing the net and working on specimens. Our last tow came up with tight kinks in the last 10-15 meters of cable so we were forced to lay off from further tows at 12 midnight. The water has shoaled up from an even 2,000 fathoms to 100 fathoms or so as we came over the continental shelf. Swimming crabs passed us in windrows at times early in the evening. Their total numbers must be literally incredible. I figure that there were 12 per sq. yard in sight at times tonight with

concentrations much higher than that. For days we have been steaming through waters that might average one crab per 12 sq. yards of surface.

I am now of the opinion that the filaments on their appendages may serve in filter feeding in addition to the possible service as flotation mechanisms.

The crew is beginning to emerge as a collection of rather rare birds. A scientific ship such as this seems to attract certain sorts—take the cook Stan McDade (24 years) for instance. He has been many places and done many things. He has prospected in Nevada, dug Indian relics for museums, collected snakes for a reptile institute in Brazil, and been to sea in many places. He knows something about a lot of things. He has missed his education and has hopes of returning to school, though he admits the call of far away places is stronger. He wears a little pointed beard and smokes weird shaped pipes.

The skipper—Larry Davis (35?)—is a most intelligent fellow. He has spent considerable time in the merchant marines and has been all over the world. He has been chased by jackals in Portuguese East Africa, been in several jails up and down the west of North America. He has the ability to make the most commonplace incidents into hilarious adventures. He is a rather slight, curly-headed fellow with a constant smile. He too entertains ideas of continuing his education in some phase of marine science.

Bob MacClendon, better known as Mac, is one of the seamen. He is part Indian and part Irish. His vocation is beach bum. Mac is a very smart lad of 22 or so who spends most of his time carousing around or surfing. Larry is teaching him navigation and it is amazing the way he catches on. He seems to feel some pangs of wanting to settle down to some type of study but the beach boy element is stronger—playing the ukelele and drinking beer. He lacks confidence in himself or he might well start in college.

And then there is Uli (Eckstrom)—a real beach boy concerned with little besides raising hell and making various sorts of jokes. He is sleepy looking all the time and in a constant good humor. He too is bright but seemingly ambitionless with the exception of his avowed plan of marrying an old rich widow, waiting until she dies, and “having himself a ball” with her money.

March 23, 1950

Asuncion Bay, Baja California, Mexico

I awoke with the winch operator, Knox, poking me, saying land was in sight. I finally hauled out of the sack and went out to see Punta Abreojos heaving in view. The bay at Abreojos opens to the south, a long, low sandy point rises to a long abrupt escarpment. 5 or 10 miles behind the beach this level country rises to a series of rather abrupt volcanic mountains—1,000 feet high or so. Behind these the rugged Sierra Vizcaino can be seen. We anchored in the cove about 500 yards offshore from the little cluster of shacks that make up the fishing village of Abreojos. Up on the rise above the town is the light house.

Most of the crew went ashore to the town. Scotty and I went ashore to a group of beach dunes about 500 yards down the beach from the fishing camp. Lew took us through the surf in the little skiff. The waves were fairly high and we caught one over the stern right down my back—in spite of the water we shipped[?], we got in all right.

The dunes are about 10 feet high and vegetated with *Atriplex* and other low perennials.

We dried our clothes out on the dunes and then went out hunting lizards. We saw many *Callisaurus d. crinitus*. For the first time I saw them burrow in the sand. As far as I could tell this burrowing was much like that of *Uma*. The day was quite cool and the sand only warm, not hot. Perhaps the animal is only able to burrow under certain temperature conditions. We took a *Cnemidophorus tigris* and a *Sceloporus m. rufidorsimus*. Scotty showed me where the *Sceloporus* had run down a kangaroo rat burrow. I dug it out and Scotty yelled "snake". When I recovered I saw a torpid *Chilomeniscus cinctus*, the banded burrowing snake, lying there in the sand. From its torpid condition—it was barely able to move—and judging from its empty stomach and emaciated body, I judge it had not yet emerged from hibernation.

We walked along the beach a ways toward the village. We lit a fire and piled *Salicornia* on it—making a lot of smoke. This was our signal that we wanted the boat to come in for us. Very shortly it began coming in and we were back on board. The boat pulled out for Asuncion Bay almost immediately—and better fishing.

As we rounded the point a school of *Delphinus bairdi* came leaping and swimming toward the prow. There were about 40 or 50 of these porpoises.

Their markings are something like this [drawing]. They rolled over on their sides and seemed to swim along at 8 knots completely effortlessly.

Larry shot a shearwater with the 30-30. The bird was nearly untouched and apparently killed by the concussion. It seems to be a pink-footed shearwater.

After a short run through a beautiful moonlit sea we anchored in Asuncion Bay. I immediately lowered the night light and we took a few interesting fishes—an eel, a halfbeak[?], a young *Sebastes*, and some larval lizard fish (*Syrodus*).

Lew and I took the skiff and went fishing in the kelp beds nearby. I got one strike that took off my hook but we landed no fish.

To bed.

March 24, 1951

Asuncion Bay, Baja California, Mexico

When I got up the ship was underway for San Roque Bay, a few miles to the north. Scotty and I got together a lunch and various gear to go ashore—including my shot pistol and rifle. We were to land on San Roque Island to look for a rare color aberration of the Heerman's Gulls that nest there. This consists of a few white fathers or a patch of them on the greater primary wing coverts. It seems to occur on one bird in about 1,000 or so, so I understand.

We rounded the north tip of the island and launched the skiff.

Scotty and I began rowing ashore. As we got to the kelp beds we were met by a skiff containing a man and boy. The man seemed quite excited when he saw I was going to land on a nearby steep pebble beach. He tried to make it clear that I should follow him around the island to the lee side. He even offered to tow us. I was in no mood for a long row so I continued on toward the beach. He got more and more excited saying "peligro" and telling me that the cormorants (patos) and gulls (gaviotas) would all fly if I landed. This didn't make much sense to me as the beach looked safe enough and I wasn't worried about the birds flying.

Finally I began following him and presently we came to a sheltered pebble beach below a group of buildings and a large corrugated iron shed 500 ft. long by 70 ft. wide.

He finally made it clear to me that San Roque is a government-owned island and no one is allowed to set foot on it in any place except the building area because it is a guano reserve. The keeper said Asuncion Island, Natividad Island, and San Geronimo Island were also government owned and protected. No shooting is allowed and even the caretaker doesn't visit any part of the island except in August after the birds have left. At this time a crew of workers pick up the guano with shovels and sack it up and store it in the large shed. He said that last year they had taken 4,000 bags of 40 kg. each (about 100 lbs.) of guano off of the island.

We were able to search most of the island with the glasses. There were many hundreds of Baird's cormorants sitting in groups. They have emerald green throat membranes.

Many many western gulls were scattered over the island. There were a dozen young gulls—a dark brown overall, that were probably young Heerman's gulls, and there were 6 adult Heerman's gulls—none with any white feathers in their wing coverts.

The keeper informed me that the gulls arrived in large numbers in early April and were present in large numbers until late July. They laid many eggs and the island was thick with chicks from mid-May on he said.

The only lizards I saw were *Uta stansburiana*, and these were exceptionally numerous. Two little kids caught about 15 for us by placing a five gallon can on the ground on its side by the corner of the houses and chasing lizards into them and then righting the can. We had a cup of coffee and then looked at the weather recording instruments he tended—an anemometer, a hygrothermograph, a max-minimum thermometer in a standard weather shelter, and a rain gauge. He had a new zenith transoceanic radio which wouldn't work and I told him I would try to get someone to fix it for him from the ship.

We left the island and rowed around it to some kelp beds. Scotty fished while I looked for birds through the glasses. He caught no fish and I saw no Heerman's gulls. Finally I rowed back near the landing and we caught some parrot fish and blacksmiths in the kelp.

A storm was approaching so I hauled in the anchor rope (tied to kelp) and rowed over to meet the *Paolina-T*, which we found around the point of the island.

San Roque Island is a crescentic rocky island with a few rugged pinnacles on its northern end which may be 50 feet above sea level, and a long, nearly level area on the south half where most of the gulls were sitting. There are only 3 pebble beaches that seem approachable [drawing].

Back on board we found that the radioman was asleep and when awakened, didn't want to go ashore.

We tried to catch schooling fish with the trawl with no success. The schools sounded at our approach and part, leaving the school on either side of the ship but none behind us in the trawl.

We sailed through a great raft of cormorants—there must have been 2 or 3 thousand birds. We sailed right through the raft and split it in 2. The birds dove and came up away from the ship—like the fish.

In a while we anchored near the north point of San Roque. I took the skiff and motor and inspected the entire seaward side for Heerman's gulls without noting any but a few young birds.

I returned to the ship in the face of a stiff breeze. It was rough going in the little skiff. On board they had been catching whitefish (*Caulolatilus*) and sheepshead, in good numbers.

We returned to anchorage at Asuncion. Scotty and I went ashore with some lysol and concentrated formaldehyde to see if we could poison a tidepool. We found one deep one with eel grass in it and caught a fine series of rudder fish (*Hermosilla*) and opal eye (*Girella*). The poison did not work very well but confused and blinded the fish somewhat so that we were able to dip them up with little trouble.

There is a small fishing village on the point and we got one of the Mexicans and his son to take us back to the ship. The old man pushed the oars while standing while the young boy rowed in the bow. The old man had his oars slanted at a very steep angle. Both took very short strokes. We gave them some canned goods for their trouble. We dip netted until 10:00 PM and hit the sack.

March 25, 1951

Turtle Bay, Baja California, Mexico

We shoved off from Asuncion Bay early in the morning and proceeded up the coast toward Turtle Bay. The coast line is exceptionally rugged. Volcanic peaks come right down to the sea. 2 sea level lines can clearly be seen along the coast for miles—one a 50 ft. above sea level line, and the other one less distinct at about 150 ft.

After 3 hours steaming we came to a peninsula which at first sight, looks like an island. It was Thurlow head, the south limit of Turtle Bay. Shortly we steamed into the bay, past the white coffin (a white guano-covered rock) and anchored off the kelp beds near the old cannery.

3 small fishing boats were in the bay and an LCI.

The bay itself is roughly circular and is largely landlocked. Much of it is 4-8 fathoms deep with a sandy bottom, affording an excellent anchorage. In a gap between two ridges of mountains on the north shore of the bay there is a group of 20-30 houses and an abandoned cannery.

Scotty and I went ashore west of town. We poisoned a small pool and collected a very few fish (*Gibbousia*, *Clinocotters*). Being out of poison we began hiking up a wide mouthed canyon. Nearly all the vegetation is concentrated in river bottoms—though there is no surface water. Everything is parched. Elephant trees, ocotillo, burrow weed, goat nut, barrel cactus, *Cereus* cactus, and many small shrubs I couldn't identify grew in the wash. As we continued up it, it grew narrower, and the walls steeper. In places the steep hillsides were literally covered with a low grey-green lichen.

We passed through areas where cliffs were exposed and we could see an underlying yellow shale, an unconformity and alluvial gravel on the surface. Some mud stones we saw were shot through with selenite—in some places 2-3 in. thick. We hiked nearly to the crest of a rugged peak—climbing over a couple of dry falls enroute. On the way back we stopped and dug out a *Salvia* (sage bush) for Dr. Epling that may be the species he is trying to obtain from Baja California. I toted the plant down the canyon in a pillow case I had brought along with about 30 lbs. of dirt and rocks in it.

Scotty yodeled at the ship and the skiff came in shortly and took us back out.

After dinner Scotty and I tried our luck shooting bats with the shot pistol as they flew around the larva trap light. This trap floats on the surface and is attached to the ship

by its light wire only—so it is often quite a way from the ship, depending on currents and wind. Finally, after some time I hit one and it began drifting away. Scotty jumped in and swam after it. I hauled him aboard with the bat. A little later he shot one and it drifted way out. I jumped in and retrieved it.

These bats are most interesting. They are quite large, having a wing spread of possibly 20 inches. The dorsal color is dark brown and they have white belly fur. I noted them flying over the water dipping their tails into the water at intervals, for a brief moment. One flew over with a shining little fish held in its hind feet. Thus we determined that they were fish bats. Their uropyquim[?] (tail and membranes) and hind feet are quite modified for fish catching. The tail is long and curves inward toward the belly and the tail membranes are quite voluminous and form a little pouch when the tail is curled. The membranes are supported by 2 processes from the hind feet in addition to the tail. These processes help to produce a pouch. Thus the animal has an efficient fish scoop. The hind feet are large and long and end in very large curving claws.

Small fish are scooped up by a quick motion of the tail. Then they are probably picked out of the tail pouch with the hind feet and eaten. A large process extends from the wrist of the hind feet and aids to keep the scoop open [drawing]. It seems impossible that these bats could locate fishes on the surface by echo location. How they do it in the dark is a mystery.

We noticed some small 6 legged parasites that are reminiscent of spiders, crawling around over the bats.

Most of the crew had gone ashore and had narrowly missed a bar-room brawl instigated by an Americano-hating Mexican. Notes, dip netting, preserving, tagging, and the sack.

[Drawings on following page of murrelet and man with a pipe.]

March 26, 1951

Anchorage south of Middle San Benito Island, Baja California, Mexico

We left Turtle Bay early in the morning and proceeded out to sea toward San Benito Islands. We each took a turn in the crow's nest looking for whales.

We sighted several blue whales going north off shore from Natividad Island. These are huge beasts, greying blue in color and having a ridiculously small dorsal fin. We clocked one at 7 ½ knots. We spent some time tracking the beasts on our sonar gear and even got one on the fathometer as he passed under the ship.

Natividad Island is a long rugged narrow ridge off Pt. Eugenia a few miles. Beyond it to the north we could see Cedros Island, whose rugged skyline stood above all of Natividad. We cruised to the seaward of Cedros. It is rugged and evidences of volcanism can be seen along the coast. Two main peaks may be seen—one in the north (3,000+ ft.) and a southern one (3,800+ ft.). I could not see the pines on these peaks but could make out dark vegetation on the higher slopes.

After a while we could see the volcanic peaks of San Benito. There are 3 islands—a large western one about 600 ft. high, a low fat middle island, and an eastern island formed from 3 volcanic cones. We anchored south of the middle island in the kelp beds.

Scotty, Bob, and I went ashore on the middle island there were a great many sea lions hauled out on the beach and rocks. They were on all parts of the shore. We came

upon several groups of sea elephants—mostly calves and cows. We saw 12 bulls in all and probably 85-90 cows. Scotty and I hiked around the island and succeeded in collecting a small series of *Uta*. The animal is larger and darker than the mainland form.

Only very low sparse vegetation grows on the island. A species of *Mammillaria* cactus is exceedingly common. As Scotty says the groups look like big cells in the process of division [drawing]. Most of the bushes are densely festooned with lichens. There were 2 species of *Opuntia* cactus and a malvaceous plant with a large blue and white flower like a hibiscus.

On board we put the light over and began dip netting. Xantu's murrelets and black petrels (a dark sooty black bird) began to fly aboard. 15 or 20 of these little birds must have been on the ship during the evening. It was easy to pick these birds up and set them loose over the side. I imagine they were dazed by the light.

A short poker game, notes, and the sack

March 27, 1951

Enroute San Quentin Bay, Baja California, Mexico

Early this morning Lew, Bob, and I rowed into the little fishing camp on West San Benitos and enquired about bait schools. They informed us there were very few in the vicinity of San Benito Islands but were plentiful east of Cedros Island near Morro Redondo. I bargained for the little kids of the camp to collect lizards for me to be picked up the next day. I left a pillow case with them to put the animals in. They said there were 3 classes of lizards on the island. As far as I know only *Uta stansburiana* has been taken from the islands.

We hauled up the anchor and proceeded straight for Cedros Island. When the ship crossed the 1,000 yard line (from shore) we began proceeding southward along the coast toward the point at the south end. The island is very rugged on the north end. We could see pine trees fringing the skyline of the northern peak and down in the saddle to an elevation of no more than 1,000 ft. Other than these trees the island appears rather barren and clothed with small shrubs.

I stood a watch in the crow's nest, relieving Bob Wisner. We were watching for whales, porpoises, and fish schools. I saw none of these during my 2 hours.

We rounded the south end and then Morro Redondo on the southeast corner of the island. We saw an airplane land on the point. Shortly we saw the village of Cedros. The houses are laid out regularly. A twin-spired church, a pier, and 2 large corrugated quonset huts of the abalone canery.

The ship was joined by a large school of striped porpoises (*Lagenorhynchus obliquidens*). The speed these animals swim with a minimum of tail motion is remarkable. In keeping up with us (7.5 knots) they made about 100 tail beats per minute. When leaping clear of the water they seemed to vibrate their tail from side to side just before leaping.

Our net hauls for sardines or other bait fish have been completely unsuccessful so far and I doubt that we will have any success except under unusual circumstances. The schools are frightened by the boat and sound before the net reaches them. Further, the schools split and the net passes through clear water. The net goes a maximum of 6 knots and these fish must be able to escape the net readily. Possibly if bait are being forced to

the surface by feeding fish and by gulls from above then we might catch a few bait fish. As a tool for studying bait fish I think the net is virtually useless.

We cruised up and down the lee side of Cedros looking for schools and finding none. We anchored in a small cove just south of the north end and had dinner.

Lew and I went up the Jacob's ladder to the crow's nest after dark and looked for phosphorescent schools. We saw about 65? porpoises come racing in to get in our bow wake. They look like torpedoes as they race through the water. We saw no schools. On the advice of an Italian fisherman we proceeded toward the cannery for bait schools. We had visited the yellowtail boat St. Rita. Joe Corona, the owner, had told us about wrapping up bait at the cannery. They put out a skiff with a light and when the bait rose the boat laid the net around the skiff and the bait was brought in. He gave us a stiff shot of whisky and we were off.

Still no bait! Our schedule will not permit us to return to San Benito Islands, much to my regret. I hope my young lizard hunters aren't too disappointed. However the fishing comes first and we want to chase schools at San Quintin so off we go.

To the sack about 12:30.

March 28, 1951

Enroute to San Diego, California

Most of this day was spent steaming along northward, out of sight of land. We passed Isla Geronimo. It is a small island with 2 low peaks and some outlying rock reefs. There is a house on the south end. Along the coastline near Rosario I could see 5 sea terraces along the shore. The highest is probably about 1,000 ft. above sea level. Many subsidiary terrace levels can be seen between sea level and the lowest major terrace.

About dusk we hove in view of San Quintin Bay and put the net out for bait hauls, to a depth of 6-8 fathoms. We ran through kelp on the first haul and took a few anchovies, a midshipman, and some larval flatfishes. One more haul produced nothing but salps, one midshipman, and one larval flatfish. With the net on board I gladly went to bed as we started northward.

March 29, 1951

Ballast Point, San Diego Bay, California

When I hauled out of the rack this morning we were off Punta Santo Tomas. The ship continued steaming northward through calm seas, past Todos Santos Islands, and then Los Coronados hove in view.

We washed the ship down from stern to stern with soap and water and secured all the nets and cables. A little after dusk we pulled into San Diego Bay and anchored adjacent to Ballast Point to await customs in the morning.

Bob and I put the light over the side and shortly Scotty and I began to catch anchovy larvae in numbers. We caught our best dip net collection in a couple of hours as far as numbers of individuals are concerned. There were pijoe[?] fish, anchovy larvae, *Atheriopsis*?[?] larvae, and adult anchovies. These adults were feeding voraciously on the larvae. I caught 3 on a small hook baited with a larva. Anchovies are supposedly filter-feeders and to see them striking at larvae like trout was something of a surprise to me.

A poker game (I won 60 cents in beans) and notes.

A purse seiner hauled alongside and asked for fuel. They had bent their screw and had run short enroute to San Pedro. They had been to Panama fishing for tuna. They have 120 tons on board a ship like ours (a load limit is supposed to be 57 tons). Their net is a 375 fathom net (4 inch mesh) 35 fathoms deep. They simply wrap a school of tuna and purse the net and haul the fish aboard. The net cost 25,000 and lasts a year they said.

Poulsen decided we could sell them the fuel so they pulled alongside in their tuna tender with barrels for the fuel. As it is now about 1:30 AM I will fold up my tent and silently steal away to the bunk.

April 1951	Riverside County
April 1951	Guadalupe Island, B.C.
June 1951	Middle Coronado Island, B.C.
June 1951	Middle Coronado Island, B.C.
August 1951	Baja California
October 1951	Baja California
February 1952	N.E.L. Dock
February 1952	Baja California
February 1952	La Jolla
March 1952	Punta Banda, B.C.
May 1952	Rock House Canyon

April 14, 1951

Russel Palms Oasis, Riverside County, California

Connie Limbaugh and I left Van Nuys at about 9:30 AM and drove to Redlands and to Palm Springs. Skies were overcast as far east as about Ontario and sunny the rest of the way. A wind of 25-30 mph was blowing out of San Geronio Pass and out over Coachella Valley.

We tried collecting *Dipsosaurus* on the dunes but the animals had apparently been driven underground by the wind.

Air temperatures were warm enough for *Dipsosaurus*—we saw several *Uma*—but none were in evidence.

The effects of prolonged drought are evident on the dunes. The creosote bushes in particular, showed the effects. Second growth had come up from the roots inside the old dead stems and this too had dried up. Only those plants near water or along the road were green and blooming.

Dipsosaurus populations may well be fluctuating strongly as climatic shifts occur. In view of the fact that hibernating juveniles are generally in very poor condition at emergence in spring, they may or may not be able to survive, depending upon the humidity and their immediate source of moisture. A dry year might largely eliminate an age class by this means.

The adaptations of desert animals to aridity might be progressing with the changing climate—as the climate becomes more arid the animals continue to adapt to it. Their adaptations at any one time may give them little lee-way in which to survive.

Connie and I drove across the valley floor and up 1,000 Palms Oasis Road. We talked briefly with Paul Wilhelm. He apparently has sold a part of his ranch though I may be mistaken.

We met Ross Hardy and a class of 35 students. He had had little luck with his collecting.

We went for a swim in the pond at Russel Palms, went for a hike, and ate dinner.

Then we went downstream in search of *Bufo punctatus*. We found one adult male and I could verify no calling though Connie thought he heard a brief call. *Hyla regilla* were common and calling. Their tadpoles? were in the stream as were newly transformed

young. We saw a pair in amplexus. We collected some tadpoles and retired to the campfire.

April 15, 1951

La Jolla, California

Very successful collecting southeast of Indio. We took 20 *Dipsosaurus* in a region of *Atriplex*, *Franseria*, and *Larrea*. The lizards were very closely associated with the *Larrea*.

April 25, 1951

At sea, SW of San Clemente Island, California

This trip is to last 10 days and is to take us 700 miles off the coast and back. It is sponsored by the Division of Marine Vertebrates, Dr. Hubbs in charge. We are on board the *Paolina-T*, a converted trawler about 87 feet in length. The objective is to make a series of hauls with the mid-water trawl just off the continental shelf, in the center of the California current, and just outside the current. We hope to find out something about the density of the bathypelagic fauna in those regions.

We loaded and left Pt. Loma shortly after 8:00 PM today and proceeded out into a choppy sea. Skies were overcast and we passed through occasional light rain.

As we proceeded farther to sea the wind picked up and wind and waves began to toss us around. Most everyone got a little seasick. I retired to the sack and felt much better for it. Seas began to get rougher through the night—water breaking over the bow and swashing over the decks. About 6:00 AM Bob Wisner and the skipper got together and changed course toward San Clemente. With the sea following us things became much calmer.

April 26, 1951

Lee of San Clemente Island, California

Most of the day was spent uneventfully steaming toward San Clemente Island. In the afternoon we came under the lee of the island and entered relatively calm water. We made one tow of 300 fathoms. The fish came aboard badly skinned with some exceptions.

On orders from La Jolla we turned and proceeded out to sea. On our way we passed near a crew of destroyers that were firing at the island with star shells. We had to change course radically to get out of their way.

April 27, 1951

At sea approximately Lat. 30 deg. 00 min. N, Long. 120 deg. 00 min. W

Very little happened today except that we continued our cruising through calm seas. We saw a blackbird flitting along when we were 155 miles from shore (mainland). San Clemente Island is the closest land. At about 23:00 we put the net over and commenced an all night tow at 1,140 fathoms.

April 28, 1951

At sea Lat. 29 deg. 30 min. N, Long 121 deg. 00 min W. approx.

At about 4:30 AM we commenced hauling in the tow. Al noted a female blackbird resting on the boom (we are approximately 200 miles at sea).

At about 8:45 the net came over the fan-tail with a crash, breaking the cable and bending the heavy spreader-bar in a neat U. The bridle of the net fortunately hung over the guide rollers and so we were able to retrieve the net. It contained very little—a couple of big *Sternopteryx* (a species of hatchet-fish) and a few other beasts.

We put down another shallower tow (500 fathoms) and caught a few fish and some invertebrates.

The weather has grown increasingly bad as the NW wind had picked up and swells have grown larger.

Our final tow of 100 fathoms was put over the side. About 18:30 we hauled it aboard. We had 4 specimens of an amphipod, *Phronima sedcutaria*, and a few jellyfish.

The ship proceeded out to sea to make our 700 mile station. By 2:00 AM the seas were breaking over the bow and swashing constantly across the well-deck amidships. We were shipping water and rolling and pitching violently. Seas had become precipitous and the wind was picking up.

Larry Davis and Bob Wisner decided it was useless to continue, so we turned and proceeded toward San Diego. In making this turn we lost our radio antenna as seas crashed over the bridge. Our course quartered the swell and chop and we continued to roll and pitch though less than before. It was impossible to sleep comfortably. Most of us were somewhat seasick and very uncomfortable. I was so tired of lying in the sack that I got up periodically and went topside until forced back in again by increasing seasickness.

April 29, 1951

Proceeding toward Guadalupe Island

Seas continued to get higher as the wind continued between 30 and 40 knots. We had to bring the skiff inboard off the davits to keep from losing it as waves crashed over it. The nigger-head from the anchor winch came loose and boweled[?] around on deck until Lew and I hauled it amidship as Larry lashed it down.

I continued to be very uncomfortable (as did everyone else). There is no place to get away from this incessant pounding, pitching, and rolling. There is no way to get enough exercise to make lying down at all pleasant. I have been limiting myself to one meal a day as I have been spending most of the time in the sack.

Early in the evening it became apparent that our best move would be to run for the lee of Guadalupe Island rather than to continue to buck the increasing seas. We changed course and with a following sea things became much calmer on board. We stopped shipping water and stopped banging and pitching.

Al Allansore and I volunteered to stand the 12 to 4 watch. All during our watch seas began to increase in height and the winds to increase in velocity. Whole patches of the sea turned white as the swells broke around us.

April 30, 1951

Guadalupe Island, Baja California, Mexico

Our landfall was expected to be at 9:00 AM so we called Larry Davis at 3:00 AM to turn on the radar gear. I retired to the sack without having seen any indicators of land

but about 6:00 AM I felt the ship begin to buck and bang into waves and then slide into calmer waters as we came into the lee of the island between the two outer islands at the south end of the main land mass. It was a very nice feeling.

We dropped anchor in 18 fathoms along the east coast of the island.

About the time we shifted course for Guadalupe the radio informed us that an unexpected front had appeared and that we might expect winds and high seas.

Without bothering to eat breakfast I went ashore with Al, Lew, and Tom. We hiked down the shore over the rough lava rock-covered slopes. Tom, who is studying amphipods, and I hiked off together turning stones and collecting insects. Silverfish are very common as are several kinds of beetles and spiders.

A black wasp, yellow-jackets, and flies are practically the only flying insects though I saw one moth. The weaker flying forms probably cannot survive the attrition of individuals being blown out to sea.

We visited the remains of some old stone sealer's huts left by the Russians about 100 years ago. Back on board we had a turkey dinner and visited a purse seiner anchored nearby.

May 1, 1951

Guadalupe Island, North Anchorage, Baja California

Al kicked me out of a sound sleep so I could make it to breakfast. Shortly we upped the anchor and cruised up the coast toward north Anchorage. About 10:00 AM we pulled into the shallow cove under a huge 1,000 foot volcanic cliff. Great grey and black dikes cut at different angles through a black, white, and red matrix. Two narrow sand and pebble beaches stretch a short distance down the coast. A steep-walled, V-shaped canyon empties into the sea in the center of this beach. The remains of an old Russian weather station and fort are perched on the north side of this canyon.

Al, Mac, Tom, and I went ashore to make a sea elephant count before lunch. We counted 160 animals, nearly all cows and young animals, on the north part of the beach. There were 2 young adult bulls lying on the beach. The south segment of the beach was piled with animals. I counted 430 piled along the beach or swimming in the surf, including 8 sub-adult males. The beach is covered with little squares of hide and fur that have sloughed off the animals as they shed. Animals in all stages of shedding could be seen on the beach—the old brown hide hangs in tatters and you could see the grey glossy new hide between the tatters. Some of the young animals have a beautiful platinum blond hide.

We spotted a fairly large bull and prodded him with a few pebbles until he woke up. He rose up on his front flippers and gave the peculiar call of male sea elephants—it sounds like a sporadic squirting of milk in a milking bucket. The male raises his head and opens his mouth. His long proboscis hangs down into his mouth and the sound comes out—probably a combination of puffing through his nose and voice. [Drawing of sea elephant].

After inspecting the seals we took a look at the fort and adjacent buildings. There were 19 buildings in all—mostly adobes. Two cement and rock buildings of the fort are perched up the canyon wall above the other buildings. Both have gun ports and one has a gun tower. The lower building has some Russian letters made of wood along its front.

We saw many good carcasses—mostly old billies, and one feral cat slinking through the tree tobaccos in the canyon bottom.

We returned to the ship and ate a steak lunch and came back on the beach. Larry Davis, Mac, Tom, Polzin, and I went on a hike. We followed a switchback road up the side of the canyon. Apparently this was the old wagon road that ran up the mountains to the springs back in the canyon. The first of the ascent goes right up the steep canyon wall. The road is built on big rock-work walls and must have taken a tremendous amount of labor.

We hiked on up the mountain over an increasingly dim trail. Apparently the rains have washed the road away, leaving a pile of volcanic boulders. Because of this hiking was not easy. The ground is very moist and covered with a crop of annual plants such as ragweed, mallow, brome grass, and miner's lettuce in the moister crevices.

We were headed for the springs in the upper canyon. About 2 miles up the slope we came upon a herd of about 50 goats browsing on the green plants. The others went off after the goats, and I continued on up to the spring. It consisted of a series of rock pools of yellow opaque water.

On the slope across from the springs I saw a herd of about 100 goats including several shaggy old billies with manes and great hairy legs.

Far above me on the crest I could see some of the wind-swept pines with clouds of vapor sweeping over them—now visible and now hidden in the racing clouds. Al tells me there are palms and oaks in with them—all have been unable to reproduce since the goats became numerous on the island—branches are eaten off as high as a goat can stand.

I returned down the slope and found my associates rolling huge boulders into the 1,000-foot-deep, vertical-walled canyon below. The rocks made tremendous reverberations as they crashed into the canyon—like artillery fire.

We hiked down the slope and could see the *Paolina-T* far below under the eaves of the huge cliff.

Back on the beach we found 2 young elephant seals (about 300-400 lbs.) in the bottom (115 ft. down) of a fresh water well—unable to get out. Bob Wisner shot them to keep them from starving to death.

We shoved off in the skiff with all sorts of booty—goat skulls, horseshoes, and I had a plant collection.

A word about the fauna. Rock wrens are exceptionally common. They have light tan breasts streaked in some with darker tan—a dim light line over the eye, grayish tan upper parts, and a vaguely barred tail. Finches are quite common in the tree tobacco as are small hummingbirds. One little moth was very common on the windswept upper slopes of the island and I caught one grasshopper. We saw crickets, armored isopods, roaches, and many beetles, plus termites and ants.

We found scats that look like those of coyotes—full of elytras of beetles and hair (I have no idea what sort of animal could have left them).

I do not think there are any reptiles on the island as I had every chance to find them if they did occur. I rolled over boards and galvanized iron sheets for $\frac{3}{4}$ of an hour around the old fort and produced nothing but insects.

Back on board we could see goats wandering on little ledges of the huge cliff—in places you wouldn't imagine a goat could go.

Various bull sessions—chow, notes, and the old pad.

June 1, 1951

Middle Coronado Island, Baja California, Mexico

Connie Limbaugh and I went to the Coronados to do some diving and obtain kelp holdfasts. We were transported in the buoy boat piloted by the Red Scorpion (Sr. Norland) and his son.

We anchored in a little cove in middle island and dove into the amazingly clear green water. One could see possibly 100 ft. laterally. All sorts of fish swam around us—schools of blacksmiths (*Chromis*), big 8 lb. kelp bass (*Paralabrax clathratus*), brilliant orange garibaldi, great lumbering sheepshead, and trim silvery half-moons (*Medialuna*). The bottom was composed of rocky shelves and cliffs and caves—all clothed completely with red coralline algae, tunicates, sponges of several colors including brilliant chrome yellow, and colonies of tube worms. Rock fish, klip[?] or kelp[?] fish, and sculpins (*Artelius creaseri* and *Scopaenichthys*) were common in the crevices.

I captured a *Coryphoptera* (a little white goby) by running him into a bottle and clapping the lid on. Connie (a past master at this) caught a young tree fish, a zebra goby (*Lythripnus zebra*) and a couple of sculpin (*A. creaseri*). We pulled up a kelp holdfast and investigated it for fishes. A sculpin (*Scorpaena*) darted out of it.

Back at the surface we decided to go ashore. We swam in with our shoes held above the water with one hand.

The island is very precipitous though several small terraces can be located. Western gulls were nesting in some numbers on these terraces. We saw many nests containing two to three large mottled green and black eggs. It was close to general hatching time as many downy chicks were around, hiding in crevices while their parents swooped low at our heads. By rolling many rocks we captured two small alligator lizards (*Elgaria multicarinata*).

Back at the ship we moved to a little point and dove again, this time over eel grass, kelp, and rocks, and sand.

I had trouble keeping water out of my face mask and returned several times to the surface. About when my air was gone I developed an increasingly bad headache and climbed aboard, shucked my gear, and lay down. Lying in the sun felt very good. Soon Connie came in with some fish and we left.

June 13, 1951

Middle Coronado Island, Baja California, Mexico

Ten of us, 4 from UCLA and 6 from Scripps, gathered at N.E.L. Dock at 9:00 AM and proceeded toward Middle Coronado Island. Two hours later we anchored in the cove of the island.

After a hearty lunch the Red Scorpion (Norland), Connie, and I went north to Middle Rock to make a brief search for herps. We landed on a rocky shelf, and I immediately set about rolling stones in search of animals.

The island is very small and precipitous, being about $\frac{3}{4}$ of an acre in extent. It is vegetated with iceplant and *Coreopsis maritima* plus some *Echinocystis lobata*, the wild cucumber vine. The island is largely composed of jagged platy masses of sandstone and

conglomerates. On the east side subsidence has apparently taken place, leaving a 25 foot deep depression that goes below sea level at least 20 feet. This part is filled with sea water and is open to the sea through two crevasses and through a rather large subsurface tunnel. Thus it is an inland cave covered by a natural arch and filled with a beautiful emerald pool, teeming with fishes. Two sea lions barked at us as we walked in to explore. [Drawing.]

Up the hill were many birds' nests (Western gulls) and under one rock I discovered a Xantu's murrelet nesting.

On a very steep slope about ½ way to the crest I rolled a series of rocks from a sloping ledge used by gulls for nesting. Under one of these, in damp soil, were two *Batrachoseps pacificus*. What a surprise to see these animals on this desolate, tiny island in June!!

I went swimming and swam under the subsurface overhang (about 20 ft.) into the cave pool. It was a real sight to pop up in this calm water inside the cave. Three sea lions came in after me and cavorted around the entrance. With my face plate I could see them swimming in and out of the entrance.

Much more diligent searching produced no more salamanders.

Back in the lee we went south with Ted Walker to attempt a recording of fish noises on his elaborate apparatus. The records we made were indefinite and only succeeded in making us a little seasick. Once back in the cove we anchored, ate dinner (I fried up some bass fillets), and went to sleep under cloudy skies.

June 14, 1951

La Jolla, California

The morning was occupied doing a deep water poisoning (In 15 to 30 feet of water). We took such species as [list].

I spent the day photographing fishes—set up on a rocky tide shelf with all my gear. About 3:00 PM we moved to North Island. Ted Walker and I went ashore. This island is very, very precipitous, most places standing at over 30 degrees.

The first board I turned, at an old fishing camp, turned up a dead skink, *Eumeces skiltonianus*.

On up the hill we visited a couple of medium-sized caves filled with midden material—we found no artifacts but a few old cracked manos.

I caught another live skink and a *Gerrhonotus*[?]¹—both in rock rubble and low vegetation. And under a large pile of cracked sandstones we found two adult *Batrachoseps pacificus* (slender salamander) in moist soil.

This island has some patches of beavertail cactus and thickets of other low plants including wild cucumber vines.

The others dove off the precipitous shore and reported a vertical cliff going down into very deep water.

We boarded. I swam around the boat to get cleaned off, and we headed for home.

August 28, 1951

Punta Clara, Baja California del Norte

At 5:00 AM Al Allanson roused me out. We were to go on a temperature run from La Jolla to Punta Baja, Baja California. This survey, conducted by Dr. Hubbs, is accumulating data on temperature relations of the sea in areas of upwelling cold water and adjacent warm water throughout this distance. In addition the faunal relationships in this region are being investigated. A run is made approximately once a month. This particular run is being correlated with cruise temperatures being recorded offshore by the Scripp's vessel, *Crest*.

Dorothy Allanson and Johnny Fleet make up the rest of the crew. I was exceedingly sleepy, having gotten about three or four hours sleep before Al arrived.

There are approximately 55 stations in this distance. Each one is made by recording a water temperature taken by charging out to about knee depth with a small bucket thermometer. Rather striking temperature differentials are obtained –23 deg. C to 13.9 deg. C approximately. Warmest temps were obtained in bays and the coldest in unsheltered coasts with a pounding surf.

We were all riding in a single Chevy pickup ('51). After taking several stations on Mission Beach and Coronado Strand we crossed the border and headed for Ensenada, taking temperatures as we went. At Ensenada we began to investigate territory new to me. We first cruised out to Estero, south of town. This is a rather large lagoon blocked from Todos Santos Bay by a long sand spit. The lagoon entrance is rather narrow and the water piles up in choppy waves and rapid currents. It looks highly unsafe for small craft.

There is something of a resort at the Estero and is inhabited by American fishermen and their wives.

Next we went out the road to Punta Banda [drawing]. This is a bumpy dirt affair cutting through fields of ripening chili peppers (black in color), fields of tomatoes (being picked), and chaparral covered land. A thin drizzle, at times heartening into a light rain, had fallen on us from La Jolla and here served to dampen the dust. This road is usually very unpleasant because of deep dust, but today not a puff arose, and we slid and slopped through an occasional puddle.

Punta Banda is quite precipitous and clothed with chaparral plants. Agaves and sour pitahaya cacti are also very common elements in the flora.

I picked up three strands of kelp (*Pelagophychus*) and braided them into a riata. The strands were partially dried and still pliable. They are amazingly tough.

Johnny Fleet and I were unable to break two strands though we pulled with all our might. The best strands are from the long stipe just below the float. They are often 30 feet long. The riata is very elastic [drawing].

Our first station was made at Arbolitos. This is a fishing camp set on the edge of a rocky bay, defined on all edges by precipitous basaltic?? cliffs and rugged islands and peninsulas. The water in the bay is apparently quite deep and is beautifully clear, blue and green. All in all it is a most beautiful spot. Its name is said to come from a grove of eucalyptus which have been planted in a small valley back of the bay.

2:00 PM. We visited them at lunch time and ate under their shelter. Al and I hiked along an old abandoned road in search of an Indian cave he had heard about. We both got soaking wet, and I caught a 2 ½ foot red rattlesnake. This little fellow was coiled in a neat pad on a ledge of rock with rain actually falling directly on him. He was so lethargic he barely moved when I pinned him.

We made another station at Punta Banda Fish Camp and returned on a bumpy road, neatly circumnavigating the Customs checking station. We then went to Santo Tomas Canyon and drove down it to Bill Margerem's place. The old fellow is still there and peered at us out of his two pairs of glasses—one supplies the lenses and the other the ear arms and frames. He must weigh 350 lbs. anyway.

He reiterated what we had already heard—that a violent storm was headed our way and was now whipping over Cedros Island in hurricane force. The seas have, as yet, been very calm—perhaps the calm before the storm.

We continued on down the canyon and made camp in a hollow at the tip of Punta Clara. We whipped up a fine agave and cottonwood fire and a most wonderful dinner of fresh marlin steaks, an avocado salad fit for the gods, fried potatoes and onions, two kinds of wine to lighten our already light spirits, and a couple of cookies to complete it all—and, I mustn't forget—hot tea.

I was very tired and remained in camp as Al and Johnny went off fishing for lobsters with hoop nets. Everyone is one of the best as camping companions and this bids fair—hurricane notwithstanding—to be one of those all too rare trips with no strained relations whatsoever. All of us enjoy camping so much that every new thing offers its excitement to all of us.

August 29, 1951

Punta Cabras, Baja California del Norte, Mexico

Just after I had finished my note writing and hit the sack, skies began to drizzle. I had constructed a ditch around my sleeping bag and adjusted my tarp and so went off to sleep with rain pattering on my head. Sometime before dawn I awoke and found it showering rather heavily. I found all the ditches were full and I was sleeping in the center of a brown lake. Water had soaked through the bag in several places.

I cleaned out the ditches and went back to bed and to sleep in spite of the water.

In the morning I found that Johnny Fleet had been even wetter than I. Dorothy had shipped a little and Al was dry.

The rain abated and we ate a big breakfast of scrambled eggs (made of about 1 dozen eggs that had cracked on the previous day's ride).

After breakfast we spent an hour searching middens for artifacts. The bluffs above Punta Clara are covered with cracked shells and burned earth. I found some potsherds, Dorothy picked up an arrow point, and Johnny picked up another.

Before going up the canyon we went to Punta Santo Tomas, and at the mouth of this canyon I caught two *Thamnophis e. hammondi* in the fresh water, a couple of sticklebacks (*Gasterosteus*), and one tadpole. Many turtles were seen and must be *Clemmys marmoratus*.

A very strange habitat for *Hyla regilla*, the tree toad, was discovered. I caught two hopping about among the agaves and *Euphorbia misera* plants. The nearest permanent water is ¼ to ½ mile north in the Santo Tomas Canyon. I wouldn't be surprised that these frogs find water in the axils of the agave leaves and possibly even reproduce there.

We drove out, stopping briefly at Bill Margareem's place. He gave Al a pot of honey and we left. Johnny and I put our sleeping bags over the back of the truck to dry as we drove along. Skies were still overcast; fog banks hung low over the crests of hills

along both sides of the canyon. Even so our bags dried out quite well as we drove along. We bought gas at Santo Tomas and drove down the main highway to a sign saying Las Cruces Ranch, where we turned off for Punta Calaveras. The road leads up over a ridge, across a rolling barley farm and down into a sycamore and oak filled canyon. We let ourselves through a corral full of cattle and continued down the canyon with brilliant red poison oak vines tangled into dense matings over all the shrubs and trees. Though the plant is undeniably pretty I shrink slightly at a sight such as this.

We drove along a dune-bordered beach to rocky Punta Calaveras. Along this beach we found a couple of large live Pismo clams. We drove on down the coast to Punta Cabras. This rocky point is bounded on both sides of its base by white sand beaches. Strong swells and breakers crashed in on the south beach while the north side was quite calm. For the first time the skies were partly clear and we could see patches of blue.

Johnny and Al showed me how to dig for Pismo clams. They took digging forks and shovels and probed in the sand while wading up to their waists and between dunkings in the breakers. When the fork struck something hard it was pushed into the sand and the “lucky” fellow went down after the clam with his hands in the cold water (15.9 deg. C.). I caught one (with Al’s help, in this fashion).

After dinner we hiked out on the point with hoop nets to fish for lobsters. A “ripe” fishead is wired in the center of these nets and they are flung in the water alongside a rocky bluff and let set on the bottom all folded up [drawing]. The lobsters crawl on the bait and at intervals the net is abruptly raised. Lobsters were everywhere and Johnny and Dot took eleven and Al and I took eleven more—all larger than the legal minimum. We discarded all but 9—including several females with eggs attached under their tails. We saw seven or eight lobsters crawling on the bottom in shallow water or clinging to rocks just below the water line. The population here must be very large indeed.

It was very enjoyable, sitting out on the rocky point with the net on the bottom, listening to the swells swashing on the rocks and watching the phosphorescence. Along the beach at the base of the point the waves beat in a glowing white line on the sand. The air was warm and comfortable. Johnny’s eyes were really gleaming over such fine lobster fishing as this. So were Al’s, as he had been playing it up to Johnny for some time—thus a prediction come true.

We cooked the lobsters, ate some, and sat around a warm agave fire. A few stars glimmered through the clouds, and we probably will have no rain tonight.

August 30, 1951

2.5 miles S. Punta San Telmo, Baja California del Norte, Mexico

Awoke this morning with the sun brightly shining and everyone else scurrying around camp packing and preparing breakfast.

We packed and drove southward through *Agave-Euphorbia* association. We saw many *Sceloporus rufidorsum* (scaly lizards) sunning on the road in the morning sun. About 1.5 miles S. of Punta Cabras Al took us over the bluff just above the sea and down into a cove. In an undercut bank quantities of fresh water (very slightly saline) dripped from the roof from thick mats of porous green moss. Purslane and a small green vine

grew around the edges of the pond and much salt grass (*Distichlis*) clothed the bank in front of the spring. I am sure this spot of greenery could be seen from the sea.

Farther down the road we caught some *Uta* and a beautiful striped racer (*Coluber lateralis*). This snake was sunning on the road and I stalked up on him and grabbed him as he started to move.

We drove up over a rocky hill on a rather poor dirt road and came into Colonia San Isidro, a group of ranch houses and eucalyptus. 3.4 miles south of the Colonia we came to the point (San Isidro) where we took a very brief dip in the cool clear water. We saw a leopard shark swimming between us (3-4 ft.). A little farther on we sighted a blow hole in the rocky shelf along the shore. A hole about 1 ½ feet across lead downward into a subteranean cave. Waves swept in and forced the air and spume out the hole (30 feet from the water's edge) with a rush and a roar, sometimes 20 ft. in the air. The suction as the wave receded was also tremendous.

Johnny, after suggesting we put a whistle in it, placed a 4 lb. flat rock across about ½ of the entrance. The rock was moved to one side with a following "blow".

We continued on to the Johnson ranch and San Antonio del Mar. A ranch house and barns and fields comprise the ranch. We turned westward toward a low range of beach dunes. A short hike brought us to a clam camp where a buxom Mexican woman was washing her long black hair. The little valley in the dunes had a covering of sedge (*Carex*) and a spring.

Out on the beach we could see piles of Pismo clam shells as far as one could see. In two places men sat shucking out clams (in spite of the month, which is theoretically dangerous). The beach is beautiful, flat, and crescentic. Clams must be very common here and must also be being decimated by fishermen. Probably a deep water population of near-normal proportions still exists as the Mexicans do not dive for them as far as we can see.

We left the beach and drove up onto the broad (8-10 miles) Colvett Plain [drawing]. It is very similar in vegetative aspect to the San Quentin plain to the south. *Agave-Euphorbia* association is dominant. *Encelia* is very common. The plain abutts the water at steep bluffs and rocky slopes. We drove out a road (first road to the right) S. of two tall posts to the bluff. The road goes down a steep canyon and into a twisting wash to the beach. It was too steep and sandy for us to follow. We all hiked out to a nearby point to look at the beach about 400 ft. below. Shortly Johnny set up a cry—"fossil bones". Shortly we had collected a bag full of bones, all mineralized, including vertebrae, foot bones, ribs, and a horn base. Probably the beast was a deer or elk. They came from a ferrous sandy layer about 8-10 ft. below the surface layer of the plain. Johnny again set up the cry—this time "Come here—isn't that a point?" Sure enough it was a perfect spear point. He found another before we could get going. Several artifacts were found including a rough mano, possibly a stone hammer, several points and scrapers, and a polished operculum (ground flat on both sides and drilled) [drawing].

The points were made of a black chert and a green chert. Manos were of sandstone. Al thinks the points are pressure flaked and represent a later culture (contemporaneous with Digueno??). The manos appear more primitive and Al thinks they may represent a culture contemporaneous with San Dieguito). The oldest artifacts at least, appear to come from a layer of midden material about 8 ft. below the level of the Colvett Plain. In many places midden material was washed from this level and deposited

on top of lower levels. This layer extended along the cliff face, overlooking the sea, for ½ mile at least.

We drove on to the San Rafael River Valley. This valley contains some nice farms and much salt marsh (*Salicornia* association) area.

We drove up along the sea bluff and dropped down by San Telmo Lagoon. Here we noted phalaropes (either red or northern) feeding in the lagoon. They were involved in a peculiar maneuver.

Many birds, widely separated from one another and often solitary, were spinning around in circles in the shallow water (2-3 inches) of a salt pond. They apparently propelled themselves around with their feet. They could be seen picking at the water surface as they spun. Later I tried to shoot one for crop analysis and certain identification and found the bottom of the lagoon was covered with red algae and the lower inch or two was teeming with brine shrimp (*Artemia*). Apparently these birds swim in circles and thus stir the water and brine shrimp up and feed on them. There were no foot marks on the bottom.

We drove on and camped with the three volcanoes of San Quintin Plain visible in the distance. San Martin Island could also be seen.

Dinner (another glutton style), Johnny's stories of his no hit-no run baseball game, notes, and the sack. It's a clear, breezy night and pleasantly cool.

August 31, 1951

Punta Baja, Baja California del Norte, Mexico

We were roused out at dawn by Al and proceeded to Punta Camal. Here we took a temperature on a cobble beach. We then proceeded inland and very shortly captured a black racer which was sunning on the road. We stuffed him in a discarded water can (the striped racer had escaped by poking a hole in our snake sack). About 50 feet farther we came upon a dead *Crotalus enyo furous*. This is the third known specimen and is a considerable northward range extension. The snake was in very poor shape and crawling with beetles, but I preserved him anyway.

The surrounding terrain was a grain field on either side and a new dirt road. The nearest natural habitat was ¼ mile north on a rocky hill covered with *Agave*, *Euphorbia*, and sour pitahaya.

We proceeded to Colonia Guerrero and bought gas. Then we drove to the beach at a camp of some fishermen who used large nets and an army duck. They caught perch, flatfish, shark, and corvina the man said. He also mentioned that lisa (mullet) were present in the brackish lagoon just north of the camp.

After returning to the main graded road we drove rapidly to the San Quintin Plain and thence down to the old pier (muelle) once used by the British colonists of this plain, nearly 100 years ago?? We then got well lost in the pickleweed marshes (*Salicornia*) and finally emerged at Santa Maria Lagoon at the mouth of Arroyo Santa Maria.

Long rows of white sand dunes separate the flat beach from a reed-filled marsh inland. This marsh is supposedly full of fresh water bass. Forster's terns were feeding over it when we stopped. Pismo clam shells litter this beach as far as one can see. San Martin Island has been visible offshore all morning and is nothing short of tantalizing to me. It has a landlocked harbor, a crater, and an endemic *Uta*.

We drove back in our tracks and then to San Simon, a small settlement along the main road set among old eucalyptus trees.

We crossed Arroyo Santa Maria, passing some houses nearly buried in blown sand and up through rocky hills, down a deep canyon, past a sand-covered hill to Rancho Socorro—noted for its *Phyllospadix* covered beach and its warm tecate beer. I saw a flight of black bellied plover here.

We made various stations along the plain north of Rosario and passed along the rough road over the marine terrace. I took a photo at the type locality of *Crotalus enyo furosus* Lowe and Norris—and then we entered Rosario Canyon, first proceeding southward along the coast to a fishing camp at a beach with four natural arches.

The road up the canyon was rough and long and it was a great relief to see the valley and village.

I really have a place in my heart for this place and to see it appear in the V of the canyon, out of all the surrounding desolation, was a soul-satisfying sight. Its farms are lush and green—its fig trees, palms, cottonwoods, plums, pears, and willows are inviting. Its little adobes with their checked walls, great patches of raw adobe showing through the plaster, thatched roofs, gnarled and crooked supporting beams, and dusty streets are typical of everything nice that is Mexican.

In old town, across the river, we saw the bells of the old spanish church hanging on a beam swung between two trees, waiting to be rung each Sunday. The afternoon light, with its accentuated color and light and shadow set off the scene.

We continued on a good road through agave-covered hills to the coast south of Punta Baja. We drove out on the point. It is long, narrow, and barren. Winds must scour its surfaces relentlessly. A tarpaper fishing shack, a skiff filled with seaweed (to keep it moist) and an old spar and tackle, are the only signs of permanent habitation. Flat, rocky reefs line the north and northwest sides. San Geronimo Island can be seen offshore a little to the south. After temperatures we returned to the agave canyon, camped, ate our usual fine meal by a crackling agave campfire, and I wrote these few notes while the others went to bed. It has been a hard, jouncing day. Skies are clear with scattered clouds and it had been and is warm. To the sack.

September 1, 1951

Colvett Plain, Baja California del Norte, Mexico

Incessant screeching from Al finally roused me out about 7:00 AM. Johnny and I barked at a sea lion which was swimming by in the surf and succeeded in turning him around. He came clear up in the surf and stayed there looking at us. Several flights of pelicans strung by—gliding on the updraft from wavecrests. Flights of black-bellied plover, willits, and godwits flew by.

After I spent some time inspecting a series of middens around camp we drove out to Punta Baja and took the morning temperatures. The west side was 16.10 deg. C. and east side 14 deg. C.—quite a difference.

We then backtracked and drove toward Rosario through agave-covered hills. We saw a flicker, ladder-backed woodpecker, and California quail.

Just before we reached Rosario I spotted a black racer alongside the road. In the mad scramble that followed he almost got away. I grabbed the tip of his tail just as he was going in an agave. I swung him around to keep him from biting me, hitting Al on the

leg with him. Finally I got him in the water can and we drove on—down stream to Rosario Lagoon. This is a deep reed-bordered lagoon of very considerable size.

We caught a fair series of sticklebacks (Gasterosteus aculeatus) a new southern record for the form. Other larger fish live in the lagoon also—as we saw them jump. They may be mullett.

We investigated another part of the lagoon—near a group of *Washingtonia* palms. I walked into a great quagmire of mud and reeds and accomplished very little.

We drove on up to Old town and saw a pair of bronze bells hanging on a beam swung in a tree. They were dated—one was 1738 and the other 1800. Both were from Mission Santa Rosa—here at Rosario and now largely ruins.

These bells are still rung to call the village people to church. We rang them quietly and they had fine tone.

Old town is an interesting melange of adobe houses with thatched roofs, new plastered buildings—set on the slope of the canyon above fields of corn and vineyards and orchards of avocados, figs, peaches, etc. All in all this is a most verdant valley.

We bought gas at the main town and continued on up the Rosario Canyon road, out onto the marine terrace to the north toward San Simon and San Quintin. About 1:00 PM we came to a DOR red rattlesnake and stopped for lunch while Al skinned him out. The marine terrace above us is capped by a hard gray layer that breaks off in great blocks where undercut by erosion. This layer continues for miles and we had been having some discussion about it so I hiked up the cliff and found it to be a hard conglomerate underlain by soft sandstone.

I rode in the back for a few miles, jouncing along playing my harmonica, until we nearly got stuck in sand at Santa Maria Arroyo. Johnny and I jumped out and finally Al drove it through by trying a couple of times.

A house of clay and wattles has been built in the middle of this dune and what a dream castle it is—sand swirling in the front door, nothing growing in the yard, and several eroded grimy looking people in the house or trudging through the dune—on both sides are fields and farms.

Though we tried valiantly, no wine was to be had at any of several stores where we asked—such a barbaric country—what do they do to raise tired spirits at sundown. Our wine at sundown has become a ritual on this trip—so much so that we made off with all 4 bottles and are now desperately destitute.

We drove on past San Quintin—bought gas at Colonia Guerrero and drove to Cahualu and to Arroyo San Rafael. I shot a phalarope (northern) that was whirlygigging in the lagoon to check the identification and stomach contents. The first shot had no effect on the sitting bird, but a second shot dropped him in flight—which surprised me no little bit as I was using my .22 shot pistol. Stomach contents revealed very little except the elytrae of small beetles and what may be partially ground-up brine shrimp.

We gathered great mounds of dry agaves and drove up onto the barren Colvett Plain and camped in a low defile.

Skies are partly clear—the day has been beautiful—a 15-20 mph breeze passes us in gusts.

September 2, 1951

South of Punta San Jose, Baja California del Norte, Mexico

We were greeted this morning by grey foggy skies. At breakfast (a hearty meal at Dorothy's insistence) an immature cowbird came hopping into camp. He was very tame and went around picking up seeds nearly oblivious to us. A little cottontail fed unconcernedly a few yards away.

We drove along the coast on a fairly good dirt road to Johnson's Ranch and further down the coast to Punta San Isidro (Ysidro??). Before reaching the point we searched the shores for a cork raft we had seen on the way down. We stopped at the blowhole while I took a picture of Johnny dropping orange peels in it.

Shortly we turned up San Vicente River Canyon. It is a deep, sandy-bottomed canyon with a dense growth of willows, blackberry vines, and other streambottom vegetation.

Water flows down the canyon both in a little stream and in a diversion ditch lined with a dense growth of plants. Sticklebacks were seen in both.

About 3.5 miles upstream we could see scattered pines clinging to a rocky cliff. We stopped and Johnny and I hiked up over the ridge. A dense stand of these pines clothes the north slopes of perhaps 150 acres of this rocky mountain. The pines are closed-cone pines with 2 needles of medium length (equal) to a bundle and a knobby cone with the largest projections on the upper side.

Chaparral species were associated around the fringes of the pine stand—*Quercus dumosa*, lemonade berry, *Rhus laurina* (sumac) and others were common (manzanita).

I saw no animals in the pines but noted several downed and rotted logs lying on a thick duff of pine needles.

While we were hiking, Dorothy and Al were not idle—they were out stealing tomatoes from a nearby tomato patch.

A short way farther upstream I saw a turtle (*Clemmys*) slide off into the shallow stream. While catching him I also caught a garter snake. This turtle has been smelling up the truck ever since.

We continued up and out of this beautiful canon at San Vicente and then down the pavement to Santo Tomas. There we picked up a bottle of Chianti for our sundown ceremony and drove SW on a dirt road toward Punta San Jose. This road is steep and rocky but quite passable. First it cuts up over a hill back of Santo Tomas and then tends right (another road goes left) and enters a pretty farm valley with rolling grain fields and a green vineyard. The streambed is shaded with huge sycamores and great, spreading live oaks. A real live oak woodland continues downstream for a mile or so. We passed through a couple of ranch gates, by the adobe ranch house and buildings, and down the canyon wall.

Shortly we emerged onto the rolling marine terraces four or five miles from the sea and finally dropped down onto the broad terrace just above the sea. We continued in a northward arc to Punta San Jose. The sea was all white caps in a strong northwest breeze, which swept across the point unabated.

Al and Dorothy and I hiked out to the end of the point (leaving Johnny to hunt abalone below the shark fishing camp where the road ends).

It is a wild place. The wind whips across a barren wave-fluted sandstone point. Just offshore to the northward are two rock pillars covered with guano. On one cormorants have nested so long that each nest site is now an individual guano-mound, giving the rock a warty appearance. Behind the point a great 150 ft. cliff of sandstone

risers from the water. Monster cirques have been cut from its face—not by ice but by the incessant undercutting of the waves.

We hiked up a steep slope to the top of this cliff and looked over at the seas and point below. I then left Al and Dorothy and went across the agave-covered terrace and hiked down into a pretty L-shaped canyon—out of the wind—and proceeded down it to the car.

We gathered wood at the fish camp. I hiked down on the beach while Al and Johnny took a water temperature. A broad, sandy beach stretches out toward the kelp beds offshore. On it were numbers of an organism I cannot even place in its proper phylum (colonial tunicates). They may be coelenterates or sea-cucumbers or tunicates. They are flattish, pale yellow, and uniformly punctate and range from 1 inch across to 6 or 7 inches. They look like this: [drawing]. They are quite jelly-like. I did not dissect one to check its internal workings.

We drove back down the coast and up a side canyon past an abandoned adobe ranch house and up onto a sumac-covered bench. While backing the truck around to make camp Dorothy scared out a 3 ½ ft. Southern Pacific diamond back rattlesnake. He raced off through the brush, and I finally shot him and preserved him.

We ate our usual fine meal in the calm dusk of the canyon with the company of a warm camp fire. Skies are clear and the night is warm. Our canyon protects us from the wind that still rages over the ocean below.

We have been keeping a fairly complete bird list. It is as follows:

Raven, Double-breasted Cormorant, Heerman's Gull, Western Gull, Western Kingbird, Anna's Hummingbird, Great Blue Heron, Brown Towhee, Meadow Lark, Brewer's Blackbird, Marbled Godwit, Western Willet, Sanderling, Hudsonian Curlew, Royal or Caspian Tern, Killdeer, Horned Lark, Mourning Dove, Ruddy Turnstone, Brown Pelican, House Finch?, Sparrow Hawk, Pintail Duck, Loggerhead Shrike, Ladderback Woodpecker, Scoter, Northern Phalarope, Mockingbird, Wrentit, Yellow Throat, Forster's Tern, Calif. Jay, Calif. Quail, Cooper's Hawk, Black Phoebe, Cactus Wren?, Audubon Warbler?, Road Runner, Turkey Vulture, Belted Kingfisher, Yellow-headed Blackbird, Yellow or Pileated Warbler, Red-tailed Hawk, Brown Thrasher, Common Loon, Marsh Hawk, Black-bellied Plover, Sandpiper (species?), Semipalmated Plover, Dowitcher, Red-shafted Flicker, Rock Wren, Marsh Wren?, Cliff Swallow, Common Cowbird, Chipping Sparrow??. Western Tanager, Hooded Oriole, Ash-throated Flycatcher, Gnatcatcher, Spotted Towhee

September 3, 1951

La Jolla, California

We got up fairly early and drove southward in hopes of finding a road through to Punta Calaveras that would save us the trouble of returning to the Highway 18-20 miles inland (by road).

The road took us slowly into the foothills past some desolate, abandoned ranches, now sprouting fine crops of young agaves in their fields.

Farther inland we entered rolling valleys set in among chaparral-covered peaks. Sycamores seem to indicate farm houses and more than once, when we could see the trees, farm houses were nearby.

We entered a grain ranch and shortly stopped when Johnny and Al heard a rattlesnake buzz in the bushes along the road. It proved to be another Southern Pacific rattlesnake, about 3 ft., 6 in. long. Al skinned it.

We drove on through chaparral-choked stream valleys. Doves were common everywhere as were quail.

Finally we hit the road we had taken out to Punta San Jose and shortly were in Santo Tomas. About 20 mi. S. of Ensenada Al screeched to a stop and I leaped out and caught a garter snake crossing the road.

This was Labor Day and it took us about two hours to get across the border; cars were backed up so far from the gates. The drive home was uneventful.

As I had thought at the start my company proved to all be fine campers (among the best I have ever traveled with), humorous and free and easy. It was a most enjoyable trip.

October 13, 1951

Arbolitos Camp, Baja California, Mexico

Finally after much last minute arranging and buying, we (Bill Walton and I) left for Punta Banda. This trip is to be the reconnaissance for our thesis work in Todos Santos Bay. Bill (Isaac) is studying foraminifera distribution in the bay and I, the temperature relations of the fishes.

Our drive was uneventful for the most part, all the way to Ensenada. Passing over the beautiful canyon at San Miguel, north of Ensenada, reminds me that I must drive up it some day.

A new cut off takes one into Ensenada through the slums instead of through the gate.

We bought bread and gas and continued out to Punta Banda, making only a few minor mistakes on the way.

At the head of the estero we took a mud sample (for forams) as the tide was out and the entire flat was just a series of puddles. Several huge flocks of ducks passed overhead, flashing and wheeling in the sun.

At the whaling camp we found skiffs to be 3\$ per day. It was [?] so we decided to go over to Arbolitos and make camp.

This beautiful rocky cove, dotted with rugged islands, is a truly beautiful spot. Seas were calm and skies clear.

Skiffs were 3\$ here too. We saw a fellow carrying a guitar down in the fish camp and when the camp cook, Bernardo, came up to talk to us, we asked him about it. He invited us to come down and listen.

After dinner we went to the camp and were shown into a chink-filled, slatted shack lighted by a single kerosene lamp. About seven fishermen were seated inside. An old guitar (with fine tone) was produced and the music began. One fellow picking the guitar with a toothpick and later a tooth out of a comb, made wonderful music on the instrument. He played all manner of difficult chords and runs. We heard Guadalajara and Mexican Mule Train, Rancho Grande, and others I can't remember.

Bill and I gave them about ½ a bottle of port. An old fellow fished out a quart of 192 proof alcohol and diluted the 20% wine ½ with it. All hands drank up as the Mexican harmony poured through the chinks onto the moonlit mesa around us.

We sang a couple of songs for them and joined them on Cielito Lindo. Our songs sound without rhythm after their singing.

We left as they rise at 3:00 AM and went to our campfire. We were joined by three curious people from Van Nuys and Bernardo. He and I had a fine time talking. He came from Sonora and we had seen many similar things.

He told us of the Seris of Tiburon wearing wooden crosses and various colors of paint on their lower lips and faces. I learned that a quail is a Lechusa and about a cameleon that lives in the sea.

He left and I took a hike up the road, wrote these notes, and retired to the hard, hard sack on the cold ground.

October 14, 1951

La Jolla, California

We got up early, ate breakfast, and drove towards the Bufadora (blowhole or roarer). We did not drive down to the coast at Papalote Camp but instead hiked out onto a promontory to see if we could catch a glimpse of the water which is supposed to shoot 90 feet in the air. It was nowhere to be seen.

After inspecting a midden on top of the point, we drove on out a mine road toward . . . [end]

February 8, 1952

N.E.L. Dock, San Diego, California

. . . [missing material] running along the sand spit at about the Estero entrance. The *Scripps* left us and shortly was invisible.

We took temps in the surf zone along the shore and proceeded out along the point. I saw an adult Heerman's Gull with white wing feathers (primary coverts) on both wings.

The offshore wind picked up and reached 20 knots or so in gusts.

We rounded the point and encountered a very confused sea with 5-8 ft. waves just outside the lighthouse. We took the skiff southward and the seas got higher tossing our little skiff around. White caps became common and we finally decided to turn around and head for the lee of the north side of Banda Pt.

Jack and I landed and ate lunch in the shelter of a calm cove. We built a fine agave fire and dried off a bit. Then we examined a big midden in a cave back of the lighthouse. It had been excavated (by Al Allanson) revealing at least five feet of shell layers.

We tried to run down the coast again and failed and finally met the *Scripps* out in the channel between the end of the Pt. and Todos Santos Island.

About 12 midnight we docked at N.E.L.

February 22, 1952

La Mora? Canyon, Laguna Salada, Baja California del Norte, Mexico

At about 5:00 AM Al Allanson phoned and I left for his house. We drove to San Diego, had breakfast, and went across the border at Tijuana.

We drove eastward on the Mexicali road, over Rodriguez dam (1/4 full of water or so), up into the foothills of the Sierra Juarez to the crest at Alaska (an area of granite boulders, pinon pines, and various chapparal plants) and then down the Cantu grade. This grade is a most impressive series of switchbacks descending down the steep eastern scarp of the range. We passed about four busses loaded to the scuppers, on the way. The rocks are highly metamorphosed and shot through with pegmatite dikes. At the bottom vegetation was typical desert type—desert willow, mesquite, etc. A stream of green fetid water flows for a short distance in the streambottom, and a small village is located along its banks. The buildings are partly company sheds housing various road equipment and partly most incredibly decrepit shanties of cardboard and canvas.

We drove on, onto the playa and down it to Demaras Well, where we ate a fine Albacore lunch and watched the phainopeplas in the mesquites.

The road then lead us up the bajada, past the Virgin of Guadalupe, a prominent, spire-shaped rock, and southward into a veritable wonderland of little island mountains of granite boulders. We investigated some pictographs just south of Guadalupe Canyon. Some were done with charcoal or smoke and others were done with red ochre. The former were of several types [drawing], whereas the red ones were of people in this fashion [drawing]. The red ones were painted in a little overhang along the wash edge. We found a bedrock mortar nearby and potsherds on the ground. These are apparently Yuman culture, and may be Cocopah in origin.

We drove on through a forest of palo verde, ironwood, and ocotillo, past several rocky promontories to which we attached various obscene names.

We crossed the mouth of a large SW-trending canyon (upstream)—proceeded down the slope of the alluvial fan, finally stopping next to a big granite hill.

I climbed it and determined that we were about at the southern extent of the valley and since the road had given out further progress was virtually impossible. We turned around and shortly became stuck in the sand. Until dusk we worked our way back along the bajada by putting boards under the wheels, finally arriving in the mouth of La Mora? Canyon once again.

Here we camped, ate dinner, had a nice campfire and talked of this and that. The night is calm and warm and beautiful and it is fine to smell the campfire smoke once again.

Al dug a *Urosaurus graciosus* out of the sand and gravel of the bajada. The animal was about eight inches below the surface in hard-packed sand and ran off when disturbed (about sunset). I saw *Uta stansburiana* and *Callisaurus* active at this early date.

Tomorrow we hike up this canyon we think is La Mora. We can see palm logs in the wash and the marks of recent flooding. To the old sleeping bag on the hard sand. I have had enough digging and hiking today that I will probably sleep well.

February 23, 1952

Palms Canyon, Baja California del Norte

We woke up this morning after a night spent dozing on the sand evading bass-voiced mosquitos. Al cooked some fine french toast and bacon. We hiked up the canyon

toward a big rock (looks like Sentinel Rock, Yosemite). I took the right side of the canyon and Al took the left.

I came upon an old Indian campsite in the canyon bottom. It was composed of two large boulders propped together. Under these rocks the whole surface was smudged with old smoke marks and potsherds were strewn everywhere. I found a mano and several old deer bones. Along the way I found 3 other places where ollas had been but had either been broken, disintegrated by erosion, or removed.

After a while I came to the meeting place under the rock and climbed a big boulder to wait for Al. While sitting on the rock I saw phainopeplas flying from palo verde to palo verde. The rock was cool and comfortable and I sat there looking around me. Great rocky cliffs rose behind me and off to the east I could see the Laguna Salada as a white salt flat. The wash below was a flat expanse of white sand with boulders at its edges and dotted with palo verde and mesquite trees. Small elephant trees grew from the crevasses behind me. Several times I noted butterflies orienting themselves to the sun. They would land and shift themselves around with wings outspread until they were perpendicular to the sun's rays. They would rest immobile in this position for 30-40 seconds and then begin to twitch their wings and finally take off; their thermal supply recouped. I wonder if this wing-twitching is not some sort of test to see if body and muscles are not at a good "flying temperature".

Al finally came up after having investigated many caves and finding lots of pot fragments and one good bedrock mortar.

We hiked on up the canyon together looking for palms. Finally we saw five *Washingtonia* growing from a steep, rocky hillside above a travertine seepage. No water.

We were getting quite warm and thirsty by the time we stopped for lunch in the shade of a big granite boulder. We planned to go over a saddle nearby and look for palms in adjacent canyons but we soon saw a group in the canyon ahead and hiked toward them. There were 35 of them, some in the canyon bottom and some growing on the hillside. Several pools of clear cool water were found in the rocky canyon bottom. One pool was choked with rushes. We both took long drinks and caught a *Hyla arenicolor* among the rushes. I observed these toads in rock crevasses above the pools but could catch no more.

While hiking up to a nearby cave I noted some petroglyphs pecked in the rocks across the canyon above the highest pool. There were several designs: three suns with ten rays (2 ½ inches to 6 inches in diameter, not counting the rays), two inverted U's and others as illustrated [drawing].

Al hiked up the ridge while I followed the rocky canyon bottom. Shortly I came to 35 more palms growing on a small seepage in the canyon bottom. Most of these had skirts of fronds extending clear to the ground. After another drink I hiked to the top of a nearby hill and surveyed the area. I was on an extended rocky bench dissected by many shallow washes rising directly from the final precipitous scarp of the Sierra Juarez. A continuous pinon forest lines the top of these mountains. My wash swung southward on this bench, becoming lost in a morass of boulders and finally rising to a big saddle two miles or so to the south. Beyond this is probably the upper gorge of Palomar Canyon.

I finally sighted Al and hiked over to him. He had a small adult female chuckwalla which he had captured with a stick. It is surprising to see them out this early. He had also seen *Uta mearnsi*, and I saw a small *Cnemidophorus* active

We decided to hike northward and try to go down another canyon on the return trip. We traveled along the bench for a while over a dissected area of granite washes and knobs until we came to a very deep canyon, obviously a tributary of our other canyon. We were both too tired and hungry to hike farther in search of a canyon so we clambered down the steep slope covered with loose boulders and gravel and down the canyon to the main wash. I found the horns of a Borego (desert sheep), which I presented to Al, rather than carry them myself in addition to my packsack.

I tried the water of a green-rimmed tinaja which had innumerable noctuid moths and mosquito larvae in it. It was delicious after our hike.

We hiked down the wash, becoming more and more tired. The thought of the car, cool water, a cup of wine, some dinner, and a good campfire were about all that kept me going.

Finally, just at dusk, we saw the car. After a cup of water and one of wine (a good pint of sweet wine is just about essential at the end of a long hike like this one) we cooked dinner—potatoes and onions (fried), spam, hamburgers, peas, bread, jam, pickles, cookies, and good stout coffee.

Both of us are a little stiff and tired but happy after our trek. The day has been pleasantly warm and clear—ideal hiking weather.

One remarkable thing about today's hike—we saw absolutely no evidence of man's presence—except prehistoric. Once I thought I saw a gum wrapper and it turned out to be a piece of mica. I might add, a bit smugly, that we left no evidence of our passing but our footprints.

February 24, 1952

La Jolla, California

We got up a little after dawn after another bout with the @#\$\$ mosquitoes!! We drove on toward Guadalupe Canyon becoming stuck several times. Finally about 1:00 PM we stopped at the foot of a long granite spur which descends as a series of disjunct boulder piles into the bajada.

I packed a lunch and we hiked toward the canyon up a broad, flat, white, sandy wash. The sand is very moist and carpets of evening primrose bloomed over it. Shortly the vegetation became more dense and we walked along deep-rutted cattle trails through forests of *Opuntia* cactus as high as our shoulders. Ocotillos in leaf and the ever present mesquite, ironwood, palo verde, and creosote bushes made this into a desert jungle. Phainopeplas were common everywhere, presumably feeding on the berries of the desert mistletoe, which abounds in the palo verde, mesquite, and ironwood trees.

After about an hour we came around a big granite spur into the gorge of Guadalupe Canyon. Shortly we came to water and then to groups of low palms and occasional cottonwood trees. The stream became a series of clear pools.

Upstream the stream grows even more and in places there are pools large enough to swim in.

We stopped along the stream on a little sandy beach and spread our lunch out on a flat granite boulder. The sun was warm and to put aside the pack sack and stretch out was most comfortable, particularly as some of the aching muscles of the day before still

remain. Al promptly went sound to sleep. I finally started slowly upstream catching *Hyla arenicolor*.

These little canyon toads were very common and most of those I caught were sunning themselves on streamside granite boulders. One pair was observed in amplexus. The smaller male on top of the large, distended female. Neither moved and finally I tired of waiting for developments and popped them in my collecting jar. There was some desultory calling up and down the streams, which increased markedly as dusk approached.

I saw Al picking his way slowly up the wash and whistled to him. He returned the call and looked directly at me (but later I found he hadn't seen me). He then disappeared and I assumed he was up to his old tricks of stalking me. I hiked on upstream to a big pool and waterfall and then, as it was getting fairly late, I started back, a little worried about Al's long absence.

I decided to go back to the trail and look for tracks to see if he had returned to the car. Shortly I heard a war whoop and saw Al, naked as a jaybird, standing on the top of a boulder on the edge of the alluvial bench above the inner canyon. I hiked over and found he had been soaking himself in a warm sulfur spring. Though I had heard of it before and had been up the canyon twice before, I had never seen this spring. When I arrived Al was reclining in a steaming pool under the mottled shade of palms smoking a leisurely cigarette. He had not seen me and had been even more worried than I. He had gone out onto his promontory and called once every 15 minutes or so. I quickly got into the pool also. It is a most wonderful feeling to slide your aching body into the warm water.

Old Manuel Demara had dug trenches from the nearby (1,000 ft. upstream) springs to these palms to allow the water to cool sufficiently. He built a little rock house with palm log beams and a palm thatch roof on the bench about 30 yards from the pool.

There is one room for Manuel and one for his burro. He had occupied this place occasionally since he developed arthritis. He was one of the very early settlers in the Salada, having arrived shortly after the turn of the century.

What a fine place he chose! From the bench one can look down on the whole gorge filled with palms, across the canyon at the great sheer granite ramparts of the Sierra Juarez scarp, and out over the white hot Salada.

We went up and looked at the springs where they pour from the cracks in the granite. It is steaming hot and the rocks over which it pours are coated with red and orange colored algae. Palms grow nearby with their roots dipped in somewhat cooler water, but still quite hot.

We reluctantly left and hiked down the trail as dusk approached. Neither of us walked very fast and we spread out a hundred yards apart as we hiked.

A pot of coffee and another sandwich and we drove off, over the Salada and up Cantu Grade. At night this grade is really remarkable. It is about 3,000 to 4,000 feet of switchbacks and often we could look down below us and see cars and trucks creeping along at three or four levels and up where distant headlight gleams moved through the Big Dipper and Draco.

The drive home was uneventful except that I began to develop a fine cold. Arrived La Jolla at 2:00 AM.

March 5, 1952

Punta Banda, Baja California, Mexico

Pa and I started out from La Jolla about 7:15 AM, ate breakfast in San Diego, picked up a little food, and crossed the border at Tijuana.

The day was calm and clear. We could see all three Coronado Islands as we drove along the coast. South of Ensenada I noted that the kilometer signs had been moved (apparently because of some new road cuts that had been made up north. The cut off road now stands at K123 instead of K119.

We left marker signs along the road in various places for Sam Hinton and Ben Cox, who will follow us a day later. The road is rutted and there are many muddy pools, both from the rain of yesterday and the day before.

We avoided most of them by driving around them and passed along the Estero. All sorts of wildflowers were in bloom—mallow, shooting stars, purple sage, *Encelia*, owl's clover, *Coreopsis maritima*, *Isomeris*, *Lupinus*, *Cryptantha*, carpets of *Linanthus*, *Castilleja*, lemonade berry, etc. The ground is clothed with green grasses and all sorts of small annuals. The horse chestnuts are in full luxuriant leaf.

We drove through the fishing camp, up the Arbolitos road and cut off on the bay side, driving down toward Tres Hermanas. We camped on the first terrace above the shore on top of an old midden. We soon had a cooking fire burning (wood is plentiful) and a good hot lunch ready. It is a beautiful camping spot overlooking the broad arc of Todos Santos Bay.

After lunch I put on my pack and hiked down a nearby canyon to the beach. In this canyon a shallow 6-10 foot well has been dug—apparently the source of water for the fishing camp on the hill.

I poisoned a large, shallow pool just as tide started coming in. In one small area I took eight *Hypsoblennius*.

Back up the hill I hiked up to the next terrace above and dug out some old fence posts for our campfire. Pop whipped up a fine meal of rice, hot stuff, coffee and peaches just at dusk, over his fine-smelling wood fire.

We can hear an occasional coyote in the hills behind us, ravens on the cliff below, and the sound of the surf.

The air is calm and the night pleasantly warm. Though it is only about 7:00 PM I am going to crawl in the old sleeping bag.

March 6, 1952

Punta Banda, Baja California del Norte, Mexico

Arose this morning at daybreak to attempt the temperature run around the point.

We got about 2 stations down the coast and the motor stopped. After checking everything—gas, valves, etc. we returned to the fish camp and borrowed tools—we were out of gas. Finally we got a start but it was too late in the day to attempt the run.

We fished and I made a poison job in a tide pool near the end of the point with little success.

We returned to camp and cooked dinner. Ray Haworth and his friend Larry Bradshaw were there.

Later in the evening Sam Hinton and his family arrived. We all waited for Ben Cox to arrive with the tank truck. Finally Sam and I drove back looking for them and

found them walking down the road toward our camp. They were stuck in the lagoon. We had a shovel and it wasn't long before we extracted them.

Billy Hedrick had seen what must have been a *Batrachoseps*, from his description on the embankment nearby. Back at camp we sat around the campfire and ate our dinner etc.

March 7, 1952

Punta Banda, Baja California del Norte, Mexico

Up early again. This time Sam and I tried the temperature run and got to the point and two stations beyond before 20 knot winds turned us. We rode into stiff offshore winds all the way back. As Sam was piloting the skiff he got quite wet.

Back in camp we took the car over to Arbolitos camp. It was really a wild scene with the high waves dashing themselves to foam on the rocky cliffs and stacks offshore. We drove out to Papalote (Banda Fish Camp) and visited the Bufadora there. This is a big blowhole, which even at mid tide was spectacular. It shot spray 40 ft. or more into the air. At high tide it must be very exciting to watch.

I was most interested to note that various limpets (*Acmaea*, *Lottia*) occurred far up the cliff 60 ft. or more above mean sea level, under the influence of the spray. Furthermore, no plants grow on the rocks for 150 ft. on each side of the blowhole and far up the cliff, presumably because of the salt spray.

We returned (Sam almost got stuck on the steep road out of Papalote) and then some of us went down to the Estero where I poisoned a little section of estuary while the others worked a small pool. We had reasonable success in both places.

Dinner, songs, fishes, and notes, and now much rain. It is coming down in sheets outside (I am in the cab). How we will get out is a mystery at present though I am sure we will eventually make it OK. So to the sack with the rather unwelcome patter of much rain on the car roof (we have a leaky stationwagon).

Postscript: Just as I finished writing Sam appeared at the window and after some discussion we decided to leave. We woke the others and I went down to the nearby canyon to take our skiff around to the fish camp (we had pulled it up above the high tide line). After pushing off with the aid of Ben, Moon, and Sam, I rowed through some low breakers and finally started the skiff (no light) and proceeded toward the fish camp in a driving rain—saturated to the skin—even through my parka.

I beached the boat and pulled it up as best I could—tossing the anchor high on the cobble berm. Then I started out hiking along the coast back to camp. We then packed the truck and cars and families. I tried to move my station wagon and it bogged down before I had gotten a foot. Even the big truck could not pull us out. So back to bed we went after three of us hiked back to the fish camp and hauled the boat up above high tide. *Scaphiopus hammondi* were calling in the ponds on the road (tadpoles were later taken from some of the pools). I caught three toads as they were calling or hopping about in the low growth of mallow and grasses. One pair was found in amplexus in broad daylight floating in a pool.

A miserable night was spent by the Hintons and Moon and son. Pa and I slept quite well in the bed of the station wagon.

March 8, 1952

Punta Banda, Baja California del Norte, Mexico

When I awoke the rain had gone and Mattie Hinton and LeeAnn Hinton were racing around playing games.

I stayed in camp with Ben and Pop and we straightened out camp while Sam, Leslie, Moon and son, LeeAnn, and Mattie went fishing.

At noon Ben and I dragged ourselves up and carried motors and other gear down to the canyon where we met Sam with the skiff. Ben and I went fishing and set traps. I caught a *Coryphopterus* (goby) in one of my traps and we took a series of live senioritas (*Oxyjulis*).

We returned and had dinner. Thunderheads stand in the sky in various places and we have occasional heavy showers (even a little hail). The rain is once more pattering on the car roof. Tomorrow we pick up our traps and seine and leave with low tide.

March 9, 1952

Punta Banda, Baja California del Norte, Mexico

Sunday morning! We looked around us and up the slopes and peaks of nearby mountains about 2,000 feet higher than our camp was snow clothing the hillsides.

We broke camp and loaded the truck and cars. Ben took the truck on ahead and very shortly became bogged down in a mire of mud. With the aid of boards and much brush we moved on another 50 feet and began all over. After half a day's work we got the truck on up the slope to a very steep section where it mired down to the axles and differential. A new verb was born: "transed," which refers to the act of having a car resting on its transmission in the mud. We were "transed" at this time also, I might add.

The remainder of the day was spent getting the two cars up the road behind the truck and digging drainage channels to allow run-off to pour off the road.

Dad and Johnny Hedrick decided they had better go back to the USA (rather Moon, Johnny's dad, decided Johnny was to go to school on Monday) so Sam and I and Dad and Johnny walked down to the fish camp and launched the boat. Sam and I carefully removed our shoes, as we were tired of having wet feet, and placed them in the boat before wading out into the surf. We intended to beach the boat somewhere near Estero Beach, where Dad and Johnny could catch a bus to Ensenada and thence home.

It was pleasant cruising along in the late afternoon watching the colors on the hills and watching V's of black Brandts fly overhead.

As we approached Estero Beach I could see long trains of spilling breakers pounding over the long sand spit that extends from the entrance seaward. We knew we could not land so I took the boat out to sea farther, 100 yards beyond the breaking waves and we decided to go on to Ensenada where the protected bay would make landing easy.

Suddenly I looked around from the beach and saw a big wave (only 50 yards long or so) about to break on our boat. I tried to swing the bow into it but there was no time. I remember seeing the boat up on its side and seeing green light shine through the wave above us and the curling foamy crest, vague views of two or three people bracing themselves in the front of the boat. The next instant I was in the water and foam in the bottom of the slowly sinking overturned boat. My foul weather jacket had become entangled with something. I remember being quite calm while I worked it loose, deciding if I didn't make it soon I would take my coat off. It came loose, and I popped to the surface to see everyone clinging to the boat.

Sam swam away to retrieve the floating oar and we tried to right the boat. Over she came, barely floating but quickly another big wave flipped it over on us. I swam under this time. Finally we oriented her bow inshore and we took positions. Dad at the left bow, Johnny (12 years old) on the stern with me, and Sam on the right bow.

We took stock of the situation and found we were out 200+ yards in a confused surf but that tide, waves, and wind were carrying our gas cans rather rapidly inshore. One was attached to the motor by its gas line and I tried to disengage it. Finally it broke loose and floated away. Dad's pipe floated by (I said later it was still smoking but that is not true), the Spanish dictionary floated by, and one of my shoes. Johnny was quite frightened, saying, "I'm cold—I can't hold on much longer"—Sam and I both kept a grip on him on and off. Johnny was splendid however and did as he was told and did not panic. We bent our knees over the stern and each wave pushed us farther toward shore as it broke over us. Johnny said, "Gee, I'm glad I learned first aid in the Boy Scouts."

A plane flew over and we wondered if it had seen us. The anchor had fallen out and I retrieved it to reduce the drag when a big wave broke over us, sweeping Dad ahead of the boat. Though he didn't say anything, I saw the fear of death in his eyes as he wallowed in the foam alone. I threw him a line and pulled him back. Shortly we touched bottom and pulled the boat ashore. It was a long time before little short Johnny could touch.

Sam had been perfectly splendid, carrying on a light conversation with me the whole time (we had both been afraid of cramps because of our hard work during the day). The only time Dad needed help was when he was in knee-deep water and then his knees became a little weak. I saw he was wearing his tall field boots!

Right around the corner from our landing spot was the Estero Motel (Prop. Sr. Novelo). We rented a room quickly. Sr. Novelo gave us all (except Johnny) a shot of whisky.

In the room I tried to light the furnace but was shaking so badly I couldn't open the match box until I put it on the floor. Then I had a terrible time striking the match. Shortly the place warmed up and we all took a steaming shower. A visiting fisherman (Bob Vahy) lent us clothes and helped us beach the boat and retrieve the motor (still dogged to the stern). He then cast out and retrieved our gas can with his fishing pole. A real angel.

Sam and I had to get back to camp as they would all be worrying as it was after dark.

A farmer named Bill offered us a ride, which we gratefully accepted as we were wet and barefoot and 12 miles from camp. We drove to his house and got a pickup truck and commenced the journey. Just past Maneadero we came to the Chula Vista Arroyo, which was a raging torrent. Sr. Bill promptly went "plunk" in the middle of it—the lights went out and the car stopped and water came in through the door. Sam and I formed a basket carry and took him ashore dryshod.

He walked back to Maneadero while we struck out (on a strange road) for camp, 7.9 miles away. We walked, talked, and cursed the small, dark, invisible rocks. Finally I recognized the road and we continued on under an overcast sky, praying it would not rain. For some obscure reason it did not rain. About 150 yards from the fish camp we got a ride and drove into the camp to find Moon looking out to sea holding a Coleman lantern. He was naturally worried about his boy.

We staggered up to camp and found Leslie with an inflamed eye. She had something in it that we could not see, though Sam finally removed a little white speck and she felt better.

After dinner Sam hiked down to the cars (200 yards) and barely made it on his aching feet. What a day! I went to sleep under a tent on which rain tapped its unwelcome time.

March 10, 1952

Estero Beach, Baja California del Norte, Mexico

After breakfast we dug! And dug! And pushed and pulled brush. Finally I saw a Model A station wagon descend the road above us. Two wood-gatherers got out. They tried to pull our truck out with no success. Sam and I decided we had better take Leslie and the kids home. These fellows offered to take us to Estero after we said we would pay them 5\$.

Ben asked to stay and watch the camp. None of us fought for that dubious honor.

At the fish camp Senora Gonzales said we could not make the trip in the old Model A and so we decided to take her Ford pick-up. It would not start so we pushed it and it promptly (100 yards) ran out of gas. So we piled in a '37 sedan and drove off with good Mexican music playing on the radio.

After about a mile the car ran out of gas and our driver trotted off to get another one. He returned with a much battered '36 with no rear seat. If you leaned back you fell into the trunk. Tired as we were all this began to get funny. So when this car refused to go up a little hill we all started laughing, and when two cars came at it from opposite directions to push I failed altogether to control myself [drawing].

After some bumper locking we split our party and half went in the Model A (the same one that wouldn't make it) and the others in the tired '36.

We almost collided at one time and the lights on the A failed to work, but we finally arrived, took a room, and went to bed without dinner. Next morning Sam's sister rescued us in her Mercury, and outside of becoming stuck briefly in a muddy river that was crossing the highway, we made it home uneventfully.

March 12, 1952

Punta Banda, Baja California, Mexico

About 2:00 PM Sam and John Stackleberg and I started out on a rescue mission in the jeep, with a house jack, two hand winches, a block and tackle, 4 2x12 ramps and miles of rope. We got stuck briefly in Chula Vista arroyo but arrived with Ben's wine (he would have shot us all if we had forgotten this precious stuff) just as he had gone to bed.

Sam pulled out one of the wine bottles to give Ben and it had had a hole knocked in its bottom and all the wine had poured out. Luckily the other bottle was intact.

We ate dinner and went to bed. It rained that night.

March 13, 1952

Punta Banda, Baja California, Mexico

We winched and planked and dug all day, getting the truck over the hill and driving the two cars a little closer to it.

We went to bed early with a patter of rain on the canvas.

March 14, 1952

Punta Banda, Baja California, Mexico

While we were hitching the block and tackle to Sam's car, seven Mexicans headed by Leo Cortaro from Maneadero rode up on horseback in search of strayed horses and cows. They were a jolly crew. When we worked the block and tackle it gave 12 feet for every foot the car went forward and when the car began to move fast we had to run downhill, over bushes, often falling ungracefully in the mud.

With their aid we got all cars past the grade and on high ground. Rather than try to return with the jeep (which was stuck) we packed up camp and portaged it up to the truck 200 yards away. We were pooped!

We drove on and promptly became stuck in a long, soggy, grassy swale. It was dark and we were hungry and tired and so we set up camp on the hillside, lugged rainwater up from the creek, dug a big area for the tent, and I cooked dinner while everyone else tried to get a little relaxation. This was the real low point. The constant pressing oneself to the limit of physical endurance, attempting to maintain civility to one another and constant fear of rain were beginning to tell mightily.

John said it could not rain this night and it didn't for the first time in 8 days.

March 15, 1952

Punta Banda, Baja California, Mexico

By planking, digging, and pulling, and various other means we finally all got on the good hard Arbolitos road at 2:00 PM, but not until we had become stuck 8 or 9 times. I looked back and could see great muddy splotches over the grass where we had been stuck—like the footprints of some giant beast, marching back down the hill.

We drove without event, even fording Chula Vista arroyo safely, to Ensenada where we all ate a vast meal of tacos, beans, beer, sirloin steak, soup, salad, and then home through a driving rain which we could see descending on Punta Banda in force. It rained so hard at Rosarito Beach that I had to stop as I couldn't see the road and John, who was driving the jeep, couldn't see at all.

Home at 11:00 PM, a blessed bath and a blessed sack with a blessed paved road out front—let it rain!!! Through all this, everyone on the trip maintained good humor and worked to his limit. Sam and Leslie were superb company, and the more I get to know them the finer people I am convinced they are—including their two children.

Ben Cox worked himself until his lower lip practically dragged in the mud and was willing to do more and yet never lost his good temper.

Moon Hedrick and his son were good company and help and my father was wonderful, even considering the fact that he came along for a vacation. He particularly showed his best in the boat accident. I'm glad it's over, but it was an experience I shan't forget.

May, 1952

Rock House Canyon, San Diego County, California

In the morning we ate a big breakfast of french toast, bacon and coffee, and drove on to Anza. There at Jack's Place we met a big 6-footer named Harry Bergman. He wore a stetson and side-burns. He apparently knew the surrounding country like a book as he told us about several of the trails. He said he was "the original hillbilly." His name translated means "mountain-man." "Lived here 65 years, man and boy." He invited us to come and see his museum on our return.

He lives just north of Aquanga on the Anza road. We drove on, towards Palms to Pries Highway, seeing a bobcat lope across the road on the way. At Santa Rosa Indian Reservation we turned off the main highway and followed a good dirt road, always keeping to the right, driving through a rather open grove of oaks (*Q. wislizenii*) with a dense understory of *Artemisia tridentata* (Great Basin sage). Shortly we came to a forestry gate, stopped the car, and began hiking eastward up a nice little stream lined with willows and cottonwoods. Before long we came into scattered yellow pines and finally onto a big brushy rock covered flat where the stream turns northward and up onto the rocky slopes of Toro Peak?

Al and I hunted on this flat and found much evidence of Indian inhabitation. Al found the top of a big olla, an Indian pipe, and a serape. All I found were pot sherds. Leaving the stream we hiked on to a low divide and looked over into the Borego, Clark Dry Lake, and off in the distance San Felipe Creek, Superstition Mt., and the Salton Sea. It was a real view. We cut back to the southwest and crossed rocky, broken country. We were attempting to reach one of the benches on the flanks of Santa Rosa Peak in hopes of finding an untouched Indian site. We passed through a little sandy hanging valley with a single yellow-pine growing in its center and then down into a beautiful narrow canyon that descended as a series of sandy and rocky steps through pinons and huge ribbonwoods (to 25-30 feet tall).

We had previously eaten lunch and thought we might turn back before too long when I made a misstep and sprained my ankle while jumping off a big boulder. I lay down on the sandy stream bottom for a moment to get a hold of myself and then hobbled off a few yards, down the creek. Al and I decided to hike on down into the Borego, rather than attempt the 12-mile uphill climb over the rocks back to the car. We hiked off down the canyon and after ½ hour my ankle no longer hurt me badly but remained weak so that each step had to be considered.

Shortly we saw we would have to cross 2 or 3 ridges to get to Colin's Valley and the Borego so we decided to hike into Clark Lake.

We descended quickly down bouldery slopes (the worst hiking of the day) and finally into the highest reaches of Dry Wash. We felt the desert heat for the first time as we passed through creosote bush and ocotillo. Hiking was much easier as we were walking in a broad sandy wash. I tried to shoot a quail for dinner with my shot pistol and attempted to eat some mistletoe berries but I fail to see what the birds like about these bitter little objects. For dinner we were planning on what we could catch plus a piece of cheese and some bread I was carrying in my pack.

Al turned lizard hunter. I told him to shoot them in the head as there was less meat there.

We found a nice Indian site where upper Dry Wash passes southward through a winding narrows, a few miles upstream from Rockhouse Canyon [drawing].

We found many potsherds and a fine bedrock mortar. I was getting thirsty by this time (we had one canteen of water) and spent some time digging in the moist stream bed. I imagine water would have been reached at 2 to 32 feet down but I wasn't that thirsty.

We hiked on in the afternoon. Our chart told us we should be within 5 to 7 miles of Hidden Spring in Rockhouse Canyon. I told Al I thought a big scar on the mountain would be close to the spring. We hiked for it over large alluvial benches.

We passed over an area of nice fine clean sand and found some excavations which we later determined to be the "Spindle Whorl Indian Site." Very shortly we came up close to my scarred mountain. It was dusk and the light was fading fast. Then we came to the brink of a 400 ft. deep canyon abruptly. In the bottom we thought we could see Jeep tracks. Neither Al nor I could figure how to hike down the steep slope in the fading light.

Al said, let's hike along the rim a ways, which we did. Shortly Al said, "Hey, a trail marker!" It was a huge granite boulder with small ones piled on top of it. At that moment I saw a nice broad sandy trail leading down the slope. We took it and before we got ½ way down, darkness had fallen. Shortly we stopped and I heard the calls of *Bufo punctatus* and *Hyla*. These amphibian calls told us water was near and that we had come upon Hidden Springs. The trail came out right at the spring. This old trail is marked on the chart and I wouldn't be surprised if it has been used since Indian times.

It had been a long day and we had hiked close to 30 miles. We built a fire and lay down beside it—after drinking our fill at the spring. Al said, "Break out the cheese and bread and let's eat." I said, "You do it, I'm too tired." So he rummaged around in the pack sack, throwing gear right and left—no cheese. We had left it in the car. So we ate a sumptuous meal of two slices of brown bread (vitamin-enriched) and all the water we could drink.

The spring is a small one—a small pool perhaps 6 feet long and 2 ½ feet deep at the base of a rocky cliff. *Hyla regilla* was present and gave a single note call very much reminiscent of *Hyla arenicolor*. I estimated the populations of *Hyla regilla* and *Bufo punctatus* at about 25 individuals each. These amphibians live in a place isolated by 25 miles and a range of mountains from the nearest populations of the same species. They must have been isolated since pluvial times and probably have undergone wide fluctuations during moist and dry periods since then. These animals represent one of the most isolated relicts with which I am familiar.

Hubbs and Miller (1945?) say Clark Lake did not overflow during pluvial times into Borego but this is hard to believe.

While lying by the fire we heard the rocks of the cliff above begin to clatter and slide. I jumped up (on my poor aching bare feet) and so did Al. They proved to be on the opposite side of the canyon—probably some animal coming to water.

We decided the more we could hike at night the less would be left for tomorrow in the desert heat—so we wearily got to our feet (we had frozen up considerably) and hobbled down the sandy wash in the moonlight. After a while, we limbered up a bit and hiked on fairly easily.

At about 11:00 PM I said to Al, "Right here, I'm going to sack out, not another step farther." I shuffled around looking for a spot of soft sand to lie down on. There was [?]. Everything was crusty. So I ended up in the ruts of the Jeep trail and continued on.

11:30 PM. Shortly Al said, “Here, no farther.” So I built a fire and we lay down on the hard sand near it. I gathered wood and stoked the fire—neither of us got much sleep.

5:00 AM. At the first signs of light we got up—ate a big breakfast of one beechnut gum and a swig of water and started out. We both had frozen up badly—my ankle and calves and knees. It took 20 minutes of hiking to break loose this time amid much cursing.

May, 1952

La Jolla, California

Before long we came out onto the long slope past Coyote Mountain down into the closed basin of Clark Dry Lake. The road was nearly straight and seemed utterly interminable. Al’s stomach was gumbly and I heard him say, “Shut up stomach—I’m just as hungry as you are.”

We saw many vinegaroons digging their oval burrows in the road ruts, but I couldn’t work up too much enthusiasm.

Finally, just at dawn, we reached the playa. It stands at 425 feet above sea level. We had started at 6,000 feet more or less.

In a grove of mesquites we saw a trailer and an old Pierce Arrow. I saw someone stirring inside so I said “Good Morning” and hoped to refill our canteen and maybe get a ride. No luck! The man inside didn’t say a word but sat and looked the door. Such desert hospitality!! Reluctantly we hiked on by and began the long hike up the Clark Lake Divide. The heat had begun to close in and there is utterly no shade except that under low creosote bushes. We were both hungry, stiff, thirsty, and weak, so we stopped every ½ hour for a ten-minute rest under a creosote bush to let the strength run back into our muscles.

About 2 hours after passing the trailer we saw the car coming up the road. Al was 100 yards behind me and he waved and jumped up and down. The man waved back and drove on!! He did the same to me! I made every gesture I could think of but he did not stop. I watched him until his car and trailer disappeared over the crest in a distant cloud of dust. It had felt good to know we could stop and wait for him to pick us up if we had to but now we knew there was no one behind us!

Al said, “I’m going to stop at 9:00 AM if we don’t see our way out and stay during the heat in the shade of a bush.”

A wise idea indeed for it would be suicide to hike in the heat for any distance and we were already very thirsty and hungry.

Just at 9:00 AM I topped the divide and looked into the Borego. Two ranch houses were near. After a rest in an old movie set (*Desert Fox: The Story of General Rommel*), I went for one and Al for another.

I walked up onto the porch of the ranch house and saw five people eating ham and eggs inside. Ham and Eggs!!!! I told them our story (through the screen door) and got absolutely no reply. I was not about to leave as I was too far gone. Finally one said, “Would you like a drink of water?” I allowed that that would please me a great deal.

A man came out, antiseptically closed the screen door, handed me a glass of water, and retreated inside. Not another thing occurred but the chink of plates, cups, and utensils for five minutes. Finally, I was offered a cup of coffee, which I drank. Then I

heard them discussing—“Do you think we should take him into town?” “I don’t know—maybe...”, etc. etc.

Finally, they got out a car (it turned out they were going into town anyway) and we drove off. We found Al under a big creosote. He never had reached his farm house.

We were let off at a restaurant when we called Dot Allanson, washed up, and went in to get breakfast. They had a “Prospector’s Special” for \$1.50 with everything under the sun on it. They didn’t have it, so we ordered a “He-Man Special” for \$1.35, ate that, and ordered a stack of pancakes. The waitress said, “I sure do like to serve boys who like to eat.”

We slept under a tamarix until Dot and Johnny Fleet came out in the pick-up and got us. We drove to the Santa Rosa Reservation, picked up my car (and the cheese), and drove down to Harry Bergman’s—what a fabulous place!

He has a nice ranch with all sorts of fruit trees, a pasture, and so much junk that he has built a separate museum for it. A sign over the door reads “Bergman Museum of Natural History—Harry Bergman, Curator.” Inside he has a fabulous Indian artifact collection—thousands of points, spindle whorls, ollas, baskets, etc. In addition, there are crabs, stamps, butterflies, old hats, political buttons, knives, lizards, dried fishes, swords, rifles, deer horns, cows, fabrics, Greek orthodox icons.

(Then we went home. I must have been too tired to finish this—K.N.)

August 1952	Baja California
Aug/Sept. 1952	Baja California
September 1952	Catalina Island/San Clemente Island
October 1952	Baja California

August 5, 1952

At sea enroute to Sebastian Vizcaino Bay, Baja California, Mexico

After an unusually intense last minute frenzy involving obtaining diving gear we boarded the *Paolina-T* for a 19-day cruise to Sebastian Vizcaino Bay.

We are planning to do a lot of fish collecting at several locations around the bay, in an attempt to correlate the fauna with the temperature structure of the bay waters. We think a warm layer of water floats over colder deeper waters. If this is true and constant we should find cold water fishes living on the bottom of the bay and warm water ones in tidal areas. This last we know to be true.

The scientific party consists of myself in charge, Jack Littlepage (interested in crabs) and Wes Farmer (interested in nudibranchs), Howard Harper (interested in wildlife management), and Bob Howell (a technician from the Marine Life group).

We will seine, poison, dredge, trawl, and use dip nets to obtain our specimens.

The skipper and cook came on board about 11:30. Newbigen, the skipper, left his wife in the hospital, but came along anyway.

Finally we sailed out of the bay, past North Island and Ballast Pt. Seas were calm and all was lashed securely so I went to bed, satisfied that all would go well.

August 6, 1952

Enroute to Sebastian Vizcaino Bay, Baja California, Mexico

The day has been calm and mostly clear. No one has shown any signs of seasickness, which is amazing on this rolling craft. I got up quite late after having lost much sleep during the frenzied preparations period. We saw several whales, which I think were finbacks. The dorsal fins were quite large and fairly well forward. One had obviously lost a portion of his fin. I saw three whales myself and all were apparently proceeding northward. We saw many sharks about 5 feet in length lolling lazily on the surface.

Murreletts were common and usually were seen in pairs. Black-footed albatrosses and shearwaters were also fairly common. Phalaropes flew from the water in large groups in front of the boat. Wes discovered that an essential part of our diving gear was missing—a little collar which allowed us to refill our diving bottles. After some stewing we thought up an idea and the engineer constructed one for us. We have radioed for the original one (to be brought down on the *E.W. Scripps* when she comes in two days), but I don't think we will really need it now.

My crew is most enthusiastic, most of them never having been to sea before. They marvelled at a small showing of phosphorescence off the bow and were most excited by porpoises swimming along in front of us (unidentified). Our work will start tomorrow at 7:00 AM when we release a bunch of drift cards. I will go read a book now or discuss vital issues with the crew.

August 7, 1952

Camp at Rompiente Pt., Baja California, Mexico

We got up at 7:00 AM and prepared to release drift cards in Vizcaino Bay. These cards are numbered and encased in a watertight plastic bag. Instructions are listed in English and Spanish, telling where cards may be sent and explaining that they are for studying ocean currents.

We sighted Cedros Island through the clouds and began releasing cards in packets of 15, every 30 minutes.

It is suspected that water circles in a clockwise fashion along the coast of the Vizcaino Desert and up along the east coast of Cedros Island. [Drawing] A convergence line has been noted extending shoreward from the north tip of Cedros Island, indicating the meeting of two opposing currents.

We could see the scraggly, closed-cone pine forests on the crest of the island as we sailed down the coast. At the central saddle I noted a fine wide canyon leading into the island. We hope to hike it soon.

Off the north tip of the island we were joined by possibly 100 striped porpoises, *Lagenorhynchus obliquidens*. Numbers of them played around the ship for 15 minutes or so.

Skies cleared and by the time we reached the south end of the island, all was sunny and bright.

We continued on between Natividad Island and Punta Eugenia in the Dewey Channel. Off Morro Redondo we saw a huge school of porpoises, possibly 3 or 4 hundred animals, playing or fishing 2 or 3 miles away.

As we continued on down the coast the wind picked up and we began getting south swell. Seas breaking along the shore looked quite ominous for landing.

Finally we entered the cove. Big swells crashed on the headlands but we could see fairly calm shores next to an old lobster camp. We loaded our skiff with all our gear and hopped aboard. It was really loaded. Just as we were about to land a series of large swells came along and crashed on the beach. Finally we raced in using the outboard and made it safely to the beach. It was not a seaman-like job but it worked. We took all our gear above tide line and set up camp in a little draw. We poisoned a little reef adjacent to the camp obtaining many individuals of a few species. Then Howard and I took the skiff through the surf with one seine and rowed down to a nice sandy beach.

I took the skiff in stern first but just as we were nearly in, a wave caught us and flipped the skiff. I pushed clear and looked around for Howard. Finally I started to turn the boat over when I felt him swimming out between my legs. He had been trapped under the boat and as the water was very shallow he was having trouble getting out from under. I was mighty pleased to see him pop to the surface and I am sure he was even happier. We beached the skiff and tipped it up, pouring out the water.

We could see that it was impossible to go back through the surf so we decided to beach the skiff until tomorrow morning when the surf would be lower.

I had Howard take a hold of the braile of our seine and we hauled it out into the surf. Jack and Wes took the other end and we went out into the surf. It tosses us around and battered us under but we managed to make two hauls this way. We caught vast quantities of shredded algae and a few guitar fish.

Our second haul produced a big bay perch and a rudder fish (hermosillo). We spread the seine, hauled up the boat, and hiked back to camp. We ate a big meal of spanish rice, beans, coffee, peaches, and bread.

We built a fire and sat around enjoying the good fellowship. It was a beautiful moonlit night so we sat around yakking until we got hungry again, so we cooked up a portion of the shovel-nosed shark (very tasty) and a can of corn. Howard produced some remarkable items from his pack sack. One was a plastic bag which folds into a small packet. Its use is doubtful but it is very compact. He claims it is for a raincoat but it has no arm holes or head holes. We are all perplexed. He also has a fine nylon pup tent which we spent much time trying to get him to put it up in the rainless land.

We then sacked out on the welcome ground.

August 8, 1952

Puerto Rompiente, Baja California, Mexico

We got up with the warming of the sun. After a brief breakfast we went down the beach and launched the skiff. Waves were still high but Wes and I made it through after shipping a little spray.

Very pleased with our success we rowed around the headland and beached the boat. We then walked back down the beach and helped Howard and Jack with the nets and brailes.

We arranged all our gear so it would be ready for loading. Then we took a little walk up a nearby wash. Vegetation is very sparse hereabouts, consisting of recumbent elephant trees, goatnut bushes, saltbush, and very occasional cardon cactus.

A series of gypsum and mudhills bordered the stream bed. In some places white outcrops of gypsum showed though the soil overburden. I shot a female leopard lizard and a big desert scaly lizard (on the run). Along the beach we saw several *Callisaurus d. crinitis*, apparently feeding among the algae, washed up on shore. These lizards were not seen at all in the badlands back from the shore.

We ate a good lunch at camp and just as we finished we saw the *Paolina-T* rounding the cape. We took the skiff into the water and stowed everything aboard and then put the outboard on. With the oars manned we started out through the surf. We went through one wave taking a little spray on and then a big one broke over our bow, virtually filling the boat. I decided we had better go back in so we did. Shortly we were filled and the skiff began to drift onto the rocks. I leaped out and tried to head her into the waves. We got it up toward the beach and had a mad frenzy of unloading gear etc. onto the boat. Some gear was lost but we got most everything ashore safely but wetly.

Finally we emptied the boat and hauled it ashore. The motor had been wet and there was a hole in the bottom of the boat. I patched the skiff with a piece of plywood we found, nails pulled from the shacks, old mattress ticking, and Wesson oil, which we poured on the ticking. It works perfectly and doesn't leak a drop.

Soaking wet from head to toe I climbed a nearby hill and lit a white signal flare indicating to the *Paolina-T* that we would be forced to stay ashore but that everyone was O.K. We laid gear out to dry and hauled everything up above tide line.

I found a big barrel and we worked on the outboard, shortly getting it running again. Wes lost some fins, a head lamp, towel, and shoes, and Howard lost a pair of shoes. Other than that everything was O.K. My notebook is a bit soggy but intact.

Howard cooked dinner. We had a 4-lb. can of corn beef which we attempted to eat in one meal. We did not entirely succeed. We also had brown bread and spanish rice. A few timbers borrowed from the dilapidated lobster camp supplied us with a good fellowship campfire, which I am enjoying while writing these notes. We hope for a calmer surf in the morning to launch our skiff. We will see in the morning. To the sack which I hope is not too soggy!

August 9, 1952

Chester Rocks, Baja California, Mexico

We got up close to dawn and cooked our breakfast. The surf was lower but still a bit ominous. I hadn't slept too well thinking over ways of getting off this cursed beach. It seems like it has a hold on us. Just as breakfast ended we heard a couple of toots out in the bay and saw the *PT* riding at anchor.

Quickly we loaded the skiff and started out to the surf. I saw the load was too heavy so I decided two loads would give us more chance. We unloaded the nets and diving gear and Wes and I took the skiff through without shipping a drop. We unloaded at the *PT* and I returned, making it through the surf by the skin of my teeth, safely.

We picked up our gear including the barrel and shoved off. We went through a couple of breakers but without shipping much water. I had Howard push us through and swim out to us. He forgot to take off his shoes so it proved quite a swim and he lost one shoe. We were all more than glad to get back aboard and sail out of this bay. We went up the coast toward Natividad Island and met the *E. W. Scripps* in Dewey Channel. She was riding at anchor taking current measurements.

We then continued on to Natividad Island where we landed in a beautiful little cove with a white sand beach extending up to a vertical sea cliff. We climbed up a steep trail and onto the barren undulating surface of the south end of the island. The surface was dotted with Western gulls and some downy young, larger than their parents. The gulls flew off in a screaming cloud when we walked on top. I decided it would not do to frighten them further as it is against the law to land and frighten the birds. The island is a guano reserve.

We hiked up slope into a little swale near the crest. The vegetation is very low and scrubby and very thorny. A sort of *Opuntia* cactus is very common and very vicious. I got a couple of nice lizard specimens. We walked down a little defile back to the beach. Amongst a pile of abalone shells on the beach we caught a splendid series of *Uta* (brown-shouldered lizard).

We then took the skiff around to a landing below the lighthouse and talked to the wife of one of the two men on the island (employees of the guano company). She lives in a barren wooden house which was quite neatly kept. We told her about drift cards and drift bottles, explaining we would pay her for any she picked up.

Back on board we upped the anchor and crossed Dewey Channel to Chester Rocks. These rocks harbor a large population of cormorants and sea lions. The smell is nearly overpowering for a long distance to sea.

I took my crew ashore and we luckily found a good tidepool and made a fine collection before sunset. The fauna was just a little more indicative of warm waters than the La Jolla fauna. We went back aboard, ate a belated dinner, and took care of specimens.

High surge forced me to abandon plans to attempt a deep water poisoning on the reef ashore so we loaded out beach seine and worked a pretty little beach near the reef we had worked the night before. We caught a fine series of leopard sharks and some other fishes.

Back on board we started down the coast in a considerable swell. The ship rolled and pitched a great deal. Newbegin took us in where he calculated our next stop should be, which we planned for ½ way between Chester Rocks and Punta Malarrimo.

Low bluffs line the shore and rose in two terraces to barren, sand-covered mountains. A scraggly forest of palmas del monte (*Yucca valida*) could be seen on the crest of one slope, and an incredibly decrepit fishing camp adorned the point where we planned to land. I could see nothing that promised good collecting at all but planned to poison (with rotenone) a cobble beach we could see through the glasses. I also thought I saw a good way through the surf, near the camp.

We left the boat in heavy swell and twisted the outboard and were off.

Shortly, as we came into the lee of the point, the swells decreased and seas became calm. We landed through waves no higher than 1 ½ in. and stepped out dryshod for a change. Six Mexicans were in the camp taking a siesta. I talked to one and he said they were abalone fishermen. They used a look box and a long pole with a hook on the end. They spotted the abalone through the box and then hooked it aboard.

We had an hour's wait for the tide so we took a short hike up a barre arroyo. There is an airfield here on the desert pavement and a truck trail up the arroyo.

We saw two of the tireddest coyotes I have ever seen. They sat down in plain sight 100 yards away. When we walked toward them they walked away. The only time they ran was when Howard bombarded them with rocks.

We poisoned a fine rocky pool and collected a fairly typical warm water fish fauna. Wes had a fine time collecting nudibranchs of which he got quite a number of ones new to him.

We went back to the ship through fairly monstrous swells and boarded, unloading the skiff with some difficulty as it pitched up and down alongside the *Paolina-T*. The skiff is too large to be lifted on the falls and has to be unloaded by hand over the rail and then pulled up astern, over the net roller.

We worked up our specimens and Newbegin dip netted a fine series of needle fish (*Strongyluros*) for us. To the sack in a pitching-rolling bunk.

August 11, 1952

Off Cedros Village, Baja California, Mexico

This morning we began trawling for bottom fish across Sebastian Vizcaino Bay. We rigged our 35 ft. otter trawl and put it over the side offshore from Punta Malarrimo. Shortly it became tangled on some bottom obstruction and we stopped the ship. The winch was left with the clutch off so that any heavy strain causes it to slack off and thus not ruin the gear.

We were proceeding into a considerable swell and cable occasionally slipped out on a large swell.

The net was easily freed and we obtained a good collection of kelp-dwelling fishes.

On the next haul, as we were bringing the otter boards onto the fantail, the cod-end of the net drifted under the stern of the ship. Just then Newbegin kicked the screw around a few times to head us into the swell. The net caught on the screw and we could not free it. The only thing to do was to dive down and cut it loose. Since I had had more experience with the aqua lung diving unit than the others it was my job. Diving under the stern of a pitching ship in the open sea did not, however, appeal to me. Newbegin and I got in the skiff and I put on the gear. Stan McDade brought me a sharp knife.

On my first attempt my mask filled with water and I had to come to the surface. The ship and skiff drifted away from me in a swift current and it was all I could do to swim back to the skiff, even considering my swim fins.

Next attempt we hauled in the retrieving line, which was attached to the cod-end of the net. I went down it hand over hand to the screw. Everytime the ship pitched it pushed me 15 ft. up and down in the water causing terrific currents. I had to wrap both arms around the stern post to hold on and attempt to cut the net loose as best I could.

The retrieving line had wrapped around the net, enclosing a lot of fish including one very large amorphous blob I could not identify. Finally I got the net cut loose and it was hauled aboard.

I got back in the skiff and on board. They had considerable trouble bringing the skiff up because of the swell.

The blob in the net proved to be a large electric ray who was not yet dead. There were also several hundred lizard fish, a species I have seen before only in ones and twos.

We took several more dredge hauls (using a small pipe stem dredge). The heavy swell told a bit on Howard, Wes, and myself but Jack apparently felt fine all day.

We anchored off Cedros Village in a very pleasant calm anchorage. We loaned some chain and an anchor to the *E. W. Scripps* who had just lost hers off the south end of Cedros.

Most of the crew either went ashore or visited various craft in the bay. I pickled fish and more fish. Wes caught a mess of barracuda on a jig over the side of the ship.

August 12, 1952

Off Cedros Village, Baja California, Mexico

About 8:30 this morning my crew and Ken Armstrong, the cook, piled in the skiff to start on an inspection of Cedros Island. We took the skiff along the steep east coast of the island northward until we came to a large alluvium-filled canyon called Gran Canada.

We landed at a fisherman's ranch. He came down to greet us and helped us land our boat. He fished for bass and halibut. He had several huge skiffs; one about 25 feet long. His name is Martinez. He showed us the trail to the pines.

We hiked up this beautiful big canyon, passing alluvial fans covered with dense forests of large elephant trees. Goatnut and lemonade berry were common in the creek bottom.

After a while we came to a major divide in the canyon. On a spur above the two entering canyons we saw a partially ruined rock house. The left canyon had many roses growing in it and a small stream of CaSO₄-saturated water. This was surprising as water is shown on the map only above the village. I caught some tree toads (*Hyla regilla*). We observed many deer tracks around the stream edge.

We ate a fine lunch at the rock house (which had apparently been connected with a nearby mine) and continued on up the canyon. Shortly junipers became common and we saw many big sumac bushes (*Rhus laurina*). Finally we cut off the canyon up a steep little draw towards the pines which we could see on the ridge above us. Fog lay in a huge white blanket over the crest, resembling a tremendous snow cap which extended down the draws and vanished in the sunlight.

Our draw was just a V between two talus slides of small fragments of shale. It was very steep and slid from under our feet. Finally just before we reached the crest, it became so steep we had to use our hands and knees to climb it. The sun was hot and we wished most fervently that we were on the cloud-covered crest of the ridge. Once we reached the top of the canyon it was a short hike along the ridge to the pines. Fog whipped through their branches causing them to sigh.

Festoons of moss hung from their branches. The pine needle duff was thick and wringing with moisture. I searched under punky fallen logs for salamanders with no success. These pines (*Pinus remorata*??) occur in small, isolated patches along the ridge and are apparently maintained by the almost constant cloud cover. Lemonade berries were common around the fringes of the grove and just down the hill were elephant trees. It is a great spot to see. We had to leave in order to get back to the ship before dark so we started down the steep talus slides. I had my harmonica. On one particularly long and steep slide I lead the way and skied down the slope very rapidly, playing "Skater's Waltz" in rhythm as I went. It was a fine descent except that Wes twisted his ankle. He managed the rest of the hike though. The walk back was long but pleasant. We were all glad to arrive at the skiff. Sr. Martinez gave us a halibut and a drift card his son had retrieved.

We cruised back along the coast against the current and arrived at about 6:15 on board.

In the evening we all went on board a purse seiner, the *Liberty Bell*, but they sighted no schools so we did not make a set. About 12 midnight we came aboard the *Paolina-T* and went to bed at once.

August 13, 1952

Lagoon Head, Sebastian Vizcaino Bay, Baja California, Mexico

At 7:00 AM we hauled up the anchor and began trawling operations across the bay. The damaged otter trawl was repaired and we used it almost entirely. Once with the dredge we brought up a bag full of green mud; so full that we could hardly hoist it over the fantail. There were many interesting invertebrates; sea feathers, sea pens (both colonial coelenterates), nudibranchs, many sorts of shells, octopi, crabs, etc.

Late in the afternoon I decided to do the last haul with the trawl and then to put on the dredge as the chart showed we would be going up an incline at that time. The trawl is not so good for rough going as it is relatively unprotected. When we tried to haul the trawl up it stuck fast in the bottom, the winch stopped and the lights went out. Our generator had quit and we were effectively anchored with no idea if we would lose the net or not. Finally by use of batteries we hauled ourselves over the net (in 40 fathoms) and tried to haul it loose. The winch strained until the wire was vertical. The clutch slipped several times (it is meant to prevent snapping the wire) and finally we inched the line in. It was free! It came on board perfectly intact. Mud on the otter boards makes me

think that the wire had dug into a mud hill and dragged the boards into several feet of mud. It is fortunate we didn't hit rock.

We anchored in the bay behind Lagoon Head at about 11:30 PM. The lee was most pleasant after all the rolling and rocking of today.

I climbed the crow's nest to shoot a bat I saw flying by. I thought it might have been a fish bat. It proved to be a petrel on closer inspection. Off to the sack.

August 14, 1952

Lagoon Head, Baja California, Mexico

After breakfast my faithful crew and I piled in the skiff and went ashore to do a bit of seining. Lagoon Head is a volcanic peak with two rather indistinct cones rising from a sandy undulating plain. In the distance inland, perhaps 30 miles, one can see a range of jagged peaks. The point protects a shallow bay from the north and affords a fair anchorage for small craft from prevailing NW winds.

Vegetation is everywhere very sparse; the largest plants are *Yucca valida*, the "Palma del Monte". Back of a narrow barrier beach is the Lagoon de Manuela. It is long and narrow and edged with dunes on the beach side. The water is quite deep in many places.

Our seining on a flat beach by the point produced relatively few fishes. We went down the beach and walked over to the lagoon, across the dunes.

Jack and Wes decided to walk to the lagoon entrance while Howard and I took the skiff in. The only idea of the entrance I had, came from the 1868 survey chart of the *U.S.S. Ranger*. The bar shown on that chart is now non-existent. We tried to sneak in where the old channel should have been and had an interesting few moments with the surf but made it through by dint of riding a few waves.

We met Wes and Jack walking along the lagoon shore. We made one pass with the seine and caught the net on a rock tearing the bag fairly badly. Even so we got a fair net full of fish.

We went out the entrance between lines of breakers and had no trouble at all. It was choppy before we got back to the *Paolina-T* and we had a wet ride. I spent the afternoon preparing the fish.

After dark we hopped in the skiff and headed for the beach. It was pitch black. Much phosphorescence in the water was all the light we had. I could make out a dim outline of the point and headed for shore through shoal after shoal of darting fish. I had to feel my way along as we could not see the shore at all. Finally it was upon us. The thin line where the little waves lapped up on the shore was about all we could see. Seining proved very successful. We caught a fine group of fishes including many big-eyed bass, thornback rays, corbina, halibut, topsmelt, butterfly rays, etc. etc.

Back on board we got gear ready to go ashore tomorrow at Scammon's Lagoon. I finished fixing collections at about 1:00 AM. I have to get up at 5:30. Gadzooks!

August 15, 1952

Scammon's Lagoon, Baja California, Mexico

Up at 5:30. The ship was still underway toward the lagoon entrance. My crew and I finished our packing for the skiff run into the lagoon. We are scheduled to spend 3 days collecting in the lagoon.

At 6:00, after a good pancake breakfast, we hopped in the skiff and started for the lagoon entrance. The sea was a glassy calm and the shore dunes could clearly be seen 4.5 miles away. We had a heavy load in the skiff, but it rode well and barring rough weather on the return trip or some other unforeseen trouble we should have no mishaps. We carry signal flares in case of emergency.

Bars line the lagoon entrance on both sides but the waters were so calm that we could not detect them. After a hour or so of riding we rounded the cape and entered the two or three mile broad lagoon entrance. We were startled by a small school of bay porpoise (*Tursiops gilli*), which came over close to the skiff and swam along, porpoising out of the water 15 feet away.

Skies were cloudless and sunny by the time we entered the lagoon proper and cruised along close to a sand dune lined shore. The lagoon is a vast expanse of calm water extending as far as the eye can see in some directions. Far in the distance it can be seen bordering a line of low barren mountains to the southwest. A few low reed-covered islands could be seen to the east.

I nosed the good skiff into the shore and we stepped ashore dry shod onto a little sandy flat between low dunes. With our gear unloaded and the outboard noise quieted we all became aware of the incredible quiet of this isolated and uninhabited lagoon. Howard swore he was awakened from his siesta by a little shorebird noisily padding down the beach. An occasional tern screeched as it flew overhead and we could hear the noises of birds calling from a nesting island two or three miles across the lagoon. The day had become hot and I decided everyone could do with a little rest, so we built various shelters from the sun and went to sleep on the warm sand.

We walked up and down the beach. All sorts of drift wood, some from wrecked vessels, was strewn over the dunes. We ate a fine lunch of veal chops and loaded the skiff and cruised across the lagoon toward Shell Island. This island is surrounded on the north side by a growth of eelgrass (*Zostera*) and pickleweed (*Salicornia*) flats. After running aground once I went slowly along the north shore until we came upon a clear channel to a sandy cockle-shell covered beach. This entrance is sheltered on both sides by reeds and low sand bars.

We pulled the skiff up right next to a cormorant's nest. The young fluttered their yellow throat pouches at us as we unloaded our gear. A small heron with a rusty red head and crest and a gray body had a nest in an old crate a short distance down the beach. The island is roughly crescentic, about 500 yards long, composed entirely of sand and apparently covered completely during spring high tides. There were many cormorant nests and heron nests on the island. A large flock of brown pelicans occupied the west end. A large flight of wheeling, screeching Caspian terns circled the island several times as we landed. These birds were in two discrete flocks, one would take off when the other landed. A single osprey sat on a piece of driftwood near camp. Oyster catchers, dowitchers, willets, sanderlings, black-bellied plover, and curlews were common. We watched two herons fight with each other, jumping up and down and erecting their crests just like game cocks.

We put our bags down on soft beds of dried grass. I constructed a little shelter for our gear of driftwood, of which there was an abundance. We dug a pit in the sand for our campfire and for us to sit in. We ate our dinner and sat contemplating a beautiful sunset. This island was ours for the moment and we all felt good about it.

We seined the cockle shell beach and obtained a good collection including a big white sea bass, too big to preserve. We took him back, built a "good fellowship" fire in our pit, and I fried him up for the crew at about midnight. We talked as the fire burned low, drank a couple of cups of boiled coffee (in bean cans) and went to bed.

August 16, 1952

Scammon's Lagoon, Baja California, Mexico

After getting driven out of the sleeping bag by the sun I walked around our island and photographed young birds. One little dizzy heron clacked his bill at me in a most ferocious way.

I tried poisoning some of the small channels in the *Salicornia* marsh without great success. We then hopped in the skiff to look for a place to seine. We crossed the main channel to the sand dunes and found a nice level plain and a small lagoonlet that looked fine for seining. The day had grown hot and we didn't feel much like dragging the seine. I decided to move camp to this spot in hopes of making a good haul. Back on the island we all had a good siesta and then packed the skiff. I checked my poisoning and found a good kill of *Gillichthys* and another unidentified goby.

We went across the channel in the face of a good wind and landed on the edge of the lagoonlet. As dusk set in it became apparent that we were on an island (created by the rising tide) and that high tide would soon submerge us completely. Finally we loaded the skiff and landed at the base of a sand dune above the reach of the tide. This constant loading and unloading gets very wearying.

Our evening's seining proved something of a disappointment and was very very hard work as the high tide beach is composed of very fine aeolean sands. We sank to our knees at every step. I almost lost my shoes. Then, on a somewhat harder beach we encountered tidal currents so strong that we could just haul the net in.

Back at camp we had a fine fire and coffee, and Howard showed us Jupiter's moons through my 7 x 35 field glasses. I had never seen them before. To the sack very belatedly.

August 17, 1952

Scammon's Lagoon, Baja California, Mexico

After a hearty pancake breakfast we packed the skiff and shoved off down the lagoon toward the entrance. At one place a 100 ft. dune drops off directly into the lagoon. The sand stands at its maximum angle of repose.

Jack and I climbed it and lay puffing at the top. It was quite a sight to look down this perfectly even slope at the little skiff and Howard, 100 ft. below. We lured Wes up with his camera. I gave him the contents of my pockets and dove over the edge, sliding right down to the water's edge.

We then went swimming, following the skiff as it drifted along. The water was warm and clear. An occasional porpoise swam lazily along within 8 to 10 ft. of the shore—right by us. We dried off and continued on around into the lagoon entrance. We landed on a fine beach and made camp by a huge old cast-up mast, partially buried in the sand. I dug a shelter behind it and we all piled driftwood boxes and logs up until we had a fairly windproof shelter. The afternoon breeze picked up and whipped sand over the

dunes and beach. We had sand in everything. Even with our "good fellowship campfire" we were not very comfortable.

Howard and Wes took a hike up the beach and returned with seven drift bottles they had found on the beach.

In the evening we made several seine hauls, catching puffers, needlefish, and some other interesting fish. A heavy dew had fallen and everything was damp in camp. Jack and I brewed up a pot of coffee and talked for a while and then went to bed. My ground cloth had been sacrificed to keep the motor free of sand and moisture so I slept with much sand in my sleeping bag. We hope for a calm dawn tomorrow so we will have no trouble leaving the lagoon.

August 18, 1952

Lagoon Head, Baja California, Mexico

I woke before dawn and noted a fair amount of fog and a slight breeze. At dawn I kicked out my crew and we loaded the skiff carefully without stopping to cook breakfast.

We launched though the low surf with no trouble and the blessed motor started right off and we cruised out of the lagoon. The *P.T.* was somewhere 10 miles beyond at anchor awaiting us. After a long time Wes sighted a mast showing dimly through the haze, above the horizon. It must be the *P.T.* So I headed for it and 2 ½ hours after our launching we boarded the ship and immediately (after unloading) descended upon the galley for breakfast. We were all glad to be back on board. I, for one, had felt a constant strain sweating out the weather while we were in the lagoon. Bad weather would have prevented our departure. But we were lucky.

We trawled over to Lagoon Head and towed the try net at night, obtaining some good specimens and many shrimp close to the surf. Back to the ship and to the old bunk.

August 19, 1952

Lagoon Head, Baja California, Mexico

This day we piled in the skiff and started for the entrance to Manuela lagoon. It was clear and calm. I took the skiff well down to the lagoon entrance and still failed to hit it exactly. We had a few anxious moments with small breakers piling up behind us and pushing us into the entrance as if we were a surf board. The bow stuck out of the water four or five feet at times. Finally we entered the calm waters of the lagoon and put out the try net. Much towing produced very few fishes except diamond turbot, young halibut, and sting rays.

Finally we hung the net up on some obstruction and retrieved it rather badly torn. There were again large purple sea urchins in the net indicating a rocky bottom.

The entrance is easy to find going out so we cruised right out into relatively calm waters. Six or seven foot sharks were seen jumping from the surf zone through which we had passed on the way in. They looked like mackerel sharks.

We had a wet ride back bucking the wind chop but made it back in time for chow.

After dark we loaded the beach seine in the skiff and headed for shore over calm seas. It was dark as a pocket and I stood up in the stern while steering in an attempt to see the shore. Finally, I could see a thin white faintly luminous line of the low surf. I cut the engine and we rowed ashore without even getting our feet wet.

We made four hauls in the dark water. When we rowed the skiff out to set the net, thousands of flashes of luminous light shot away from our bow—fishes shooting through the water. We took many fish—croakers, many accursed sting rays, thornbacks, a couple of numb fishes, hundreds of smelt and big-eyed bass and quantities of edible shrimps. Stan and Gene helped us and particularly helped us with the shrimp and fishes too big to pickle.

As we cruised back toward the masthead lights of the *Paolina-T*, the whole bottom seemed to rise periodically below us and in front of the skiff as shoals of fishes shot through the phosphorescent water.

On board I spent some hours preparing specimens and then repaired—a bit pooped—to the sack.

August 20, 1952

Santa Rosalia Bay, Baja California, Mexico

We left the ship fairly early and cruised along Lagoon Head in search of a poisoning spot. Nowhere did it look too promising. Almost algae-less volcanic rocks dropped through the clear water to a clean sandy bottom. Finally we located a stretch of rocky bottom near a natural rock arch and anchored.

We had a few sea lions from a nearby rookery swimming around but they didn't come in too close. I placed the poison. In the process I saw large numbers of four to five-pound kelp bass, many big opal eye, and schools of big hermosilla. It looked like a good spot but the poison did not hang too well. I dove down a little later and found only a very few fishes on the bottom.

Howard and Jack and Wes dove too and produced little but bubbles.

We all climbed aboard shivering as the water was about 16 degrees C. Off to the ship for chow.

We hauled anchor and piloted up the coast 25 miles to Santa Rosalia Bay. This place holds memories for me as it was here that Arlene Lowe stepped on a stingray. We had come down a long canyon after two dusty hot weeks in the desert to this beautiful arc of sand, put on our suits, and ran into the surf.

It looked less lonely from the ship. We could see the main rocky headland, a low sand-dune filled gap, a series of low bluffs topped by a level terrace, and then the canyon and beach.

In the evening we took the net ashore and seined the beach taking a fair series of fish. Gene, Stan, and Newby went surf fishing and had prodigious luck. They caught 61 croakers and corbina. Most all were six lbs. and over in weight. About 7/8 were large spotfins.

We had to take Stan back with us as their little skiff was nearly level with the water because of the big load of fish. We cleaned them until 12:30 AM.

August 21, 1952

Enroute to San Diego

Ted accompanied us this morning as we went around the point, and across the channel to Elide Island. I looked for a poisoning spot and finally decided on one between two large seal rookeries. The island is small, about ¼ mile long by 1/8 wide and is covered with guano. A guano keeper's house, a tent, and a small cement loading dock

are all beside sea lions and cormorants, that grace this lonely spot. The channel between the island and the shore is very shallow and apparently quite rough in any sort of a wind.

Aside from numbers of sea lions the poisoning spot was beautiful. The water was calm and clear and about 25 feet deep, covered with algae and stands of kelp.

We made a fairly good collection in spite of the fact that I was the only person who caught a single fish with the diving unit. Ted got a big kick out of the proceedings.

Back on board we worked on specimens as the ship stood out to sea toward home. We took a course that would put us 50 miles off shore in albacore grounds.

August 22, 1952

Enroute to San Diego

Little to report today except that we caught 17 albacore on jigs from the stern. These are splendid plump fish and very tasty. We had one for dinner, baked. It fed all of us amply.

August 23, 1952

La Jolla, California

We pulled in to the dock about 9:00 AM. It has been a fine trip. My crew was one of the best I have ever worked with—all were very young but willing and competent.

The ship's crew was more cooperative than any I have worked with previously and there were no strained relations that I noted during the entire trip. This is nothing short of phenomenal. The next trip on the *Orca* is bound to be different I suspect.

August 27, 1952

Cabo Colnett, Baja California, Mexico

This morning at 7:00 AM we boarded the research ship *Orca*. She is a 100 ft. converted ice breaker owned by Mr. Joseph Sefton. She has been built from the hull up as a utility research vessel and is very well equipped and arranged for all sorts of biological work. She rides beautifully and is powered by two caterpillar diesel engines. We have fine state rooms, good food, and plenty of working space for all hands. Mr. Sefton (Joe) is most enthusiastic and energetic about all the work.

Our crew consists of myself, Al Allanson, Connie Limbaugh, Gordon Alexander (a teanatode[?] specialist), Howard Harper, and Al Ebeling (a diver interested in various fish species). There is no deck force so we carry out these duties including standing lookouts and wheel watches, and cleaning the ship.

We stowed our gear in the ample locker space and tidied up the ship as we proceeded out into the bay. Al and I repaired a couple of dip nets and put a fine mesh liner in one.

I stood a couple of watches on the wheel, including one as we came into anchor at dusk in the lee of Cabo Colnett.

Vellela (by-the-wind sailors) were present on the sea in large numbers today. We saw many groups of shearwaters resting on the water north of Cabo Colnett. One very large whale swam southward about 100 yards off our beam. His long, sleek (barnacle-less) body humped out of the water as he sounded. There was a ridiculously small dorsal fin, very far aft on his back. I think he was either a finback, sei, or blue whale.

We plan to carry out a series of collections (fish) along the coast of Baja California from Punta Rosalia northward to San Geronimo Island. This is presumably an area in which cold water upwells along the coast and we will probably find a considerable number of cold-water types in evidence.

Connie just dip-netted our first specimens—a lizard fish [?], and a couple of anchovies. The lizard fish was eating an anchovy. We are anchored in eight fathoms of water.

August 28, 1952

San Geronimo Island, Baja California, Mexico

The gong sounded at about 6:00 AM. I cheated Joe out of the joy of beating it in my ear by getting up. This gong is a piece of Chinese brass and it is beat every morning and at meal times. Thus it has a Jekyll and Hyde personality.

We upped the anchor (I was put in the chain locker stacking chain). We steamed out past the imposing cliffs of Cabo Colnett into a large N.W. swell. The *Orca* is remarkably steady in a sea such as this. I have had no twinge of seasickness at all.

As we were on course to Geronimo Island a Mexican navy cutter came alongside. We dipped the Mexican ensign to them and Joe saluted the bridge. They turned away abruptly and left us in a cloud of smoke.

Al and I sat aft and mended one of the seines. Shortly we came in view of San Martin Island. Capt. Ellis took us inside, between the island and the long point enclosing San Quintin Bay.

The island is composed of two craters set close together and a series of lava flows extending from them into the sea. On the east side of the island a considerable sand spit extends out into the channel. In the curve of this spit, above a sandy beach [drawing], we could see several fisherman's shacks. The island looks as if it is vegetated with dense brush in most places. There are abrupt cliffs on most sections of the shore. The sand spit ends in a small boulder island over which swells were crashing from both sides. South of the spit we could see the entrance to a small lagoon. It surely looks interesting.

We sailed past the long spit of San Quintin for a long time. It must be 12-15 miles long.

The ship passed through large areas dotted with *Pelagia*, the large purple jellyfish. Alex and I noted schools of small fishes swimming among the tentacles. We tried to dip net a specimen but did not succeed. The tentacles appeared to be twisted in many individuals into a long, frilly appendage from the center of the bill.

After an uneventful bridge watch we came to Punta Baja. Shortly we entered an enormous raft of shearwaters. We sailed for a half hour through this huge flock. So many birds were taking off constantly in front of the boat that the noise of their feet as they ran across the water sounded like a heavy rain. Many did not take off but dove as the bow approached and swam beneath the surface, much as a murrelett swims, using their falcate wings in quick strokes. The birds seemed ponderous and had difficulty in making a quick take-off.

They dive like a swimmer making a kick-turn, legs and wings stick awkwardly into the air as the bird goes beneath the surface. A tremendous stream of flying birds swept completely around the ship and out as far as the eye could see in some directions. Most of the birds landed far ahead of the ship making it virtually impossible to make a

sensible estimate of numbers, but certainly there were several tens of thousands of individuals.

Through this flock of birds we saw the outline of Geronimo Island come through the haze. An abalone cannery boat, a coastal freighter, and a fleet of many large agar skiffs were at anchor in the lee of the small island. Many pelicans dotted the slopes and hoards of cormorants made the north part of this island black.

We dropped anchor amongst the other craft, lowered three skiffs, and a tuna tender and set about doing a poisoning job in about 20 ft. of water.

The water temp. was 16.2 degrees C. at the surface and much lower at the bottom. A considerable surge dispersed our poison so the attempt was not overly successful.

Back on board we had a splendid spaghetti and meatball dinner cooked by Jackson, Joe's good man Friday.

We worked on specimens in the splendid lab and dipnetted over the side, all with good Spanish music being played over the loudspeaking system. This ship is a wonderful work boat—by far the best I have been aboard. Everything is operative and useful and in good order. The ship is kept spotless. Joe is gruff, bluff, and good-natured unless pushed in the wrong way. He stands for no foolishness, but if one does his work willingly and reasonably well I am sure he will be of the best to work with. I must spend a little time planning our next day's stations and then the sack as dawn and the gong come early.

August 29, 1952

Santa Rosalia Bay, Baja California, Mexico

We awoke this morning to look out at a thick fog. The ship got underway at 7:04 and we passed inside of Sacramento Reef. Joe was fidgeting about taking this course in a fog and before he finally got his point across to the skipper we were a ½ hour past the reef. The fog lifted and we could see the rugged coastline of bluffs, rocky ridges, and great lava-capped plateaus off of Bahia San Carlos.

Down the coast a way we noted two whales. One lifted a huge long straplike pectoral flipper into the air and then its deeply incised tail fluke and sounded. These whales were probably humpbacks.

Huge mixed schools of the dolphin (*Delphinus bairdi*) and the striped porpoise (*L. obliquidens*) came to our bow and played about the ship. The dolphin has a small black triangular dorsal fin and a beak whereas the striped porpoise has a larger, slightly falcate dorsal, edged behind with greyish white and has no prominent beak.

As fog was closing in the skipper decided to anchor in Santa Rosalia Bay rather than at San Rosarito Bay, eight miles to the south. Onshore we noted a pick-up truck and then we saw a small skiff coming towards us. Connie saw the two men on board were wearing white identification buttons and said "Scripps Buttons"—and indeed they were. It was the Scripps crew down walking the beach for drift cards and bottles. The fourth man had gone to Punta Prieta to arrange for a guide as they intended to drive in to Scammon's Lagoon, Black Warrior, and Manuela lagoons. Roads to these places must be very obscure at best.

We found they had been stopped by customs authorities in Rosario. For fear they would be arrested one of the group had dismantled their rifle and put it piece by piece, along with their ammunition, into the big gasoline drum they were carrying. They hadn't

figured out how to remove it. Joe invited them aboard for dinner and the guided tour of the ship.

After dinner we went ashore and seined a bit, taking three stargazers, among other fish. These fish are Gulf of California types. They burrow down in the sand and trap prey that walks or swims over the sand.

Back on board we found that too many lights had been left on by our crew so we all got a lecture from Joe. He is right, however, as the generators shut down when we are at anchor and all lights operate on a bank of batteries. To the sack.

August 30, 1952

Santa Rosalia Bay, Baja California, Mexico

Up at 7:00 AM by the gong. After breakfast we gathered our gear together and put an additional small skiff in the water. We towed two skiffs with the 40 horse tuna tender. This little boat (16 ft.) pulled us along at a fine clip. We followed the shoreline through very clear waters. The water was dead calm and skies were clear and sunny. The water was a warm 23.1 degrees C. We could see enticing kelp beds and areas of eel grass and cobbles as we went along. Once we passed by a school of bait being worked by yellowtail.

The shore is a low bluff dissected by a few deep arroyos. Inshore about a mile are various 500 ft. peaks. Vegetation is low and sparse. The biggest plants are *Yucca valida*, the "palma del monte". A few inconspicuous agaves could be seen on the benches. Two big ragged ospreys flew along over the caravan of boats.

As we neared Punta San Rosarito the land became lower and composed mostly of cobbles. The point itself is low and barren and bounded on all sides by inhospitable-looking cobble beaches over which low breakers were splashing. In rough weather it could be a wild place.

We could see an interesting bottom of kelp columns, large eel grass patches, and cobbles clothed with low covers of coralline algae. Many fish could be seen, mostly big bass and opal eye.

This looked good so we stopped and anchored for a deep water poisoning. I mixed up a big can of rotenone and so did Howard. We gave them to Connie who had on his diving gear. He spread the poison in a circular patch on the bottom. Al and I put on our face plates and swam around catching some fish, mostly klip fish and bay perch and sand bass which came to the surface. Later I put on a three-tank unit and searched the bottom, picking up a considerable number of fishes—pipefish, sheepshead, least perch, bass, and others.

The eelgrass (*Zostera*) was growing in very deep beds on rocks. It was quite exciting to swim along through this dense grass scaring lobsters and big bass as you went.

Out in the open areas big seven- to eight-pound sand and kelp bass patrolled the area snapping up dazed fishes that swam toward the surface. Once I swam down to get a bay perch I could see lying on the bottom. While scooping it up my net touched a large grey rock which resolved itself into a big sculpin, which dashed off into an eel grass bed.

A six- to seven-foot mackerel shark was seen by Al Abeling and Al Allanson. I saw a five- to six-foot leopard shark swimming lazily along. Porpoises were also near. At the surface I saw Joe rowing his skiff around and bellowing like a bull at the seagulls

and terns that attempted to pick up fish. He appeared highly indignant that these birds should attempt to steal our catch.

We rounded up the skiffs and ate lunch and then rounded the point to the south, entering San Rosarito Bay. It is a shallow bay without much protection from prevailing winds and none at all from south winds.

Up the shore from a cobble beach is a small Rancho of two houses. Our UCLA friends were there with their jeep. We tried to come in near this beach but scraped the rudder of the tuna tender on the rocks. We went down a little farther and anchored our power boat and rowed the big skiff in.

We took two seine hauls here. The most interesting fish we took was a big puffer or botete.

By the time we started back a breeze had come up. I swam out to the anchored tender while the others rowed out in the skiff. The ride back was into the wind and swell. Connie, Al, and I sat up front and got saturated for our efforts. We saw many flights of pintail ducks, two frigate birds, and a big shark seven to eight feet between the dorsal and the tail. All in all he may have measured ten feet or more.

We were all pleased to get back on the *Orca*, both because we were tired and wet and because fog had come in, cutting off our sunlight. Coffee was more than welcome. It was virtually ambrosia. I spent the rest of the evening working on our collections. Tomorrow we go northward to the rugged Punta Roca.

August 31, 1952

Santa Rosalia Bay, Baja California, Mexico

Up at 7:00 AM. We ate a good breakfast of pancakes and sausage. Loading operations took an hour or so and we were off to Punta Roca, the next main point north of Punta Santa Rosalia. We cruised along through calm seas, following the shoreline.

Just north of inner Santa Rosalia Pt. we stopped to look at a large group of sea lions. They had a long sandy slide coming from the top of the hill, possibly 40 ft. to the water. Tracks where they slid down made a long line on the hill.

We cruised between Isla Elide and the shore. Some white canvas tents had been put up on shore near the permanent guano shed and house. A crew was working sacking guano. A large pile of bags lay on the little cement dock. The ever-present odor and beach flies assailed us as we passed by.

North of this little islet is a long clean crescent of sandy beach, backed by interconnected barchane type sand dunes. These dunes sweep over a low divide into the Santa Rosalia Bay area. In places black lava promontories jut up through the sand mantle, making a beautifully contrasting terrain. North of this beach tall barren reddish hills back the beach and often extend into the water as jagged points.

We saw belted kingfishers flying low over the calm sea, lonely vampire-like frigate birds high in the air, and the rather comical red-billed oystercatchers hopping on the rocky headlands. The shoreline becomes more and more rugged as Punta Roca is approached. Only occasional pocket beaches are present between rocky headlands.

South of the point is a guano covered rock. On it were many sea lions, including many little pups. In crevices we noted a red substance. On closer inspection it proved to be the chiton of swimming crabs passed by the sea lions.

We circumnavigated the point and could see Punta Negra to the north. Just south of the point we anchored in a little sheltered cove and put our poison down. The water was crystal clear, about 20 ft. deep and 19.5 degrees C.

Shortly we began to get fish at the surface. I put on a diving unit and went down. In places the current had concentrated the fish and I scooped them into my net. Kelp fish and klip fish were excessively common. The long brown feather boa alga (*Egregia*) was very common as were *Gigartina*, *Gelidium*, and *Zostera*. Rocky cliffs, often overhanging came down to white sand at 25 ft.

I chased a moray through the algae, trying to get him in my net. Finally he wriggled to safety in a deep crevice filled with big lobsters, all waving their antennae at me.

Lobsters were everywhere as were black and green abalone. A white sponge was common growing under the overhangs. We caught several tube-snouts (*Aulorhynchus*), a fish never before taken south of Coronado Islands as far as I know. While swimming back to the skiff I turned to look a five-foot sea bass right in the eye. He didn't move away as I swam toward him but merely turned to face me. I started to count his fin rays (he was 10 ft. away) when he flicked his big tail and was gone. Connie tells me he watched a big horned shark swim over me and sit on my tanks.

Al Ebeling came to the surface too quickly and became a little sick. He rested in the tuna tender. After lunch we went down the coast and stopped at a little sandy cove for a hike. We could see midden debris streaming down the hillside from a couple of small caves. We hiked up to them, finding some house rings. These are circles of stones used by Indians as a base for agave log huts. Shells and evidence of fire were very evident.

We hiked to the ridge and found seven caves in all and twelve house rings. I found a pounding stone and some worked fragments. The day was hot and I was tired from my swim so I lay down on the floor of the little cave and enjoyed the cool shade while the others were out chasing a bobcat. We walked back over hillsides covered with green lichens, so thick they looked like bunchgrass.

Low, spreading elephant trees were common and the Baja California ocotillo (*Fouquieria peninsularis*) was blooming. There were occasional cardon cacti and *Idria*. *Mammillaria* cactus and barrel cactus were also common. Back at the beach Al and I decided to swim out to the tender anchored 100 yards offshore. We took off our clothes and waded into the clear water while the others rowed out. It was most refreshing. Our trip back was uneventful except for seeing a huge V of sprig ducks flying south and a surf scoter.

We arrived just in time for a fine chicken dinner. The rest of the evening was spent with the fish and notebook. Tomorrow we go to Playa Maria.

September 1, 1952

Playa Maria Bay, Baja California, Mexico

We got up early and the ship got underway for Playa Maria Bay, 25 miles north of Santa Maria Bay. The cruise was uneventful and before long we dropped anchor in the calm leas of Playa Maria. The shore is one of rocky headlands alternating with dunes and long crescentic sandy beaches.

Al and Alex and I took the tender out and towed the try net in the bay. We caught great bags full of sand dollars and a goodly number of fish species, various flat fishes, and midshipmen.

We cruised along the coast looking for likely poisoning spots. We found some pretty fine reefs at the point. As we followed the bay around literally hundreds of big bat rays flapped along in front of us, some even broke water. In one cove we saw three coyotes walking along the edge of the water. Al took us in close and one coyote did not leave until we came within 25 to 30 yards of him and yelled. He then trotted off into the sand dunes. A big osprey flew from a rocky yucca-covered promontory in this cove and we saw big halibut skitter along the bottom as we approached.

We inspected a rocky point just inshore from the *Orca*, finding many six-foot leopard sharks and hundreds of big bat rays cruising around. I decided it was a good bet for poisoning as there were good rocks and eel grass beds.

We went back to the ship for a good bunch of lobster and coleslaw. Joe, in his usual booming-voiced boisterous way, saw Alex eating lobster without cracking the last joint of the leg. He began giving instructions at once, including grabbing some legs from Alex and cracking them with his teeth, saying, "Here, this is the way. I'm not eating your lobster."—whereupon he handed the cracked leg back to Alex. We all got a laugh out of this—including Alex.

We poisoned the reef and got a fair collection. It was too shallow for the aqualungs to be their most effective. It was a little strained at first to swim among the sharks but they soon left. Al and I took a short walk around the bay to a berm made entirely of pismo clam shells. Alex and I swam out to the anchored skiff and we went back aboard. Al, Alex, Al Ebeling, Howard, and I went ashore again for a hike.

I hiked up a little sandy canyon filled with Joshua trees, up over a ridge and into a low area filled with huge accretion dunes, 40 ft. high. A scrubby composite was the anchoring bush.

The only life I saw was a pair of LeContes? thrashers. Back at the boat Al and I put on our face plates and went diving for pismo clams. One can see them under water because their siphons stick up. With the slightest disturbance the siphons are retracted and only sand remains. The technique is to locate a siphon, dive and dig the clam out. They were very thick and from 10 ft. of water Al and I dug out about 40 in 20 minutes or so. This bay must have literally millions of clams in it as their shells often touch.

Back on board I fixed our fish collections and ate dinner. About 9:00 we loaded the skiff and went ashore to do a bit of seining. The moon is nearly full, the night and water warm and calm. We made a set on a calm beach and pulled in hundreds of pounds of *Ulva* (sea lettuce) and a fair number of fish. The strain was too much and we ripped our net. I decided it would be better to go back and seine again tomorrow night with a patched net on a clean beach. Notes, tea, toast, and the sack at 11:30.

September 2, 1952

Playa Maria Bay, Baja California, Mexico

We got up and right away started preparing gear for a poisoning job on the point. After breakfast we piled in the tender and cruised the short distance to the point. The poison was placed along a steep eel grass covered rocky reef. I dove with a three-tank unit and picked up quite a number of good specimens. Abalone (greens and blacks) were

common. Connie tapped me on the shoulder and beckoned me to follow him. He lead me out past the point into 35 to 40 ft. water and there we saw several huge sheephead bulls (30 to 35 lbs.) and lots of perch and bass and garibaldi. Then we swam in view of eight big black sea bass weighing upwards to 200 lbs. One took a pass at my flipper. Connie sunk his spear in one and promptly lost the spearhead.

After a long dive I climbed aboard. Connie came up and we went back to the boat in time for lunch. The specimens were prepared and we went back to the beach. Al and I swam around. We skin-dove and picked up nine nice abalone. Then we stretched out in the warm sand on the beach and did nothing but watch the frigate birds and ospreys and sleep. The rest was most welcome.

This evening we again loaded the skiff and cruised over to a quiet beach and seined. The night was perfectly beautiful—calm, warm, and a full moon. The water is over 70 deg. F. We hauled in many big spotfin croaker and jack smelt. Tomorrow we get up at 6:00 and go to Punta Cono, one main[?] point to the north. It is late (11:30) and I must get some sleep.

September 3, 1952

Playa Maria Bay, Baja California, Mexico

Joe had us all up with his g. d. gong at 6:30. Everyone was tired from yesterday, and he was a bit annoyed when we didn't snap to before breakfast.

We unloaded the seine and washed it and reloaded with diving and poisoning gear and were off to the next point to the north—Punta Cono. A southwest wind had come up and the sea became quite confused as there was a NW swell running counter to the SW wind chop. We shipped a lot of spray and everyone got soaking wet.

The shore north of Playa Maria is low and sandy and backed by big red barren hills. In one place a broad wash enters. The mouth is blocked by a series of cream-colored dunes back of which is a large dry lagoon. The coast swings in an arc westward to Punta Cono. Wide washes filled with *Lycium*, *Opuntia*, and *Yucca* sweep down from the hills. We could see the shells of Indian caves high on the mountain sides.

Put a Cono is a Lambolo[?]. The point is shaped like a cove but appears granitic. At its south end is a V, ending in a sandy beach at the apex. Sea lions rested on the outer rocks looking like men tied up in bags full of oil.

We cruised a ways north of the point but found no suitable poisoning points. Going back we bucked the chop and got really soaking.

The lee of the point looked like our only hope so we anchored and Al Ebeling put the poison down. We were moderately successful taking some Cottids never before taken this far south. Lobsters were everywhere and I didn't see a small one. After the poisoning we upped the anchor and sailed over to the beach off our Indian middens. We took the small skiff ashore and hiked up the canyon to these caves.

Great piles of limpets, abalones, clams, chitons, and other shells were piled in front of two caves, each 15 feet deep or so. The roofs were coated with soot, ages old now. Al and I sat down and I made a stone hammer to give to Joe for his birthday (tomorrow). This hammer was made on the midden in sight of the spirits of red men long gone. Al made him a back scratcher out of a pelican bill. We will present them with due ceremony tomorrow.

Al and I went swimming and diving for clams. There were many of them all over the bottom and windrows of shells on shore. We didn't take any clams as we are still eating chowder from the last batch back on the *Orca*.

September 4, 1952

Blanca Bay, Baja California, Mexico

We awoke this morning to find ourselves socked in with a thick fog. We had to wait until it cleared a bit so we could pilot up the coast to Blanca Bay.

Finally we shoved off and started up the coast. It quickly fogged up again and we sailed blind down the coast. The skipper said, "The fathometer should show it is getting shallower—just then the depth dropped—22-20-18-17-14-13-12, etc. At 5 fathoms he ordered the hook dropped. When the fog lifted a few minutes later we were anchored in Blanca Bay. There are three main rocky headlands, the western two volcanic and the easternmost sedimentary. We investigated two of them and another volcanic one to the south in the tender.

We saw the long stretches of sandy beach that separates the headlands and some very high cobble berms in little pocket beaches. A lone coyote wandered down one long sand beach and we were followed by several large *Tursiops*, the bottlenose porpoise.

After lunch we gathered our gear together and sailed to the outer point of Blanca Bay where we found a cove occupied by dozens of sea lions. We chased the sea lions out by tossing mussels at them and rowing around yelling and slapping swim fins in the water. Then Connie placed the poison. We had a big surge but the cove didn't let much poison escape so we got a fine kill of many big cabezon, cottids, various perch, etc. Lobsters were everywhere and so large as to be frightening. Their antennae protruded from all the crevices. I took a long collecting dive with the lung and shortly thereafter we returned to the ship.

Today is Joe's birthday. Jackson had cooked up a fine cake and meal—ham, soup, salad, etc. We gave him our gifts—the hammer, the backscratcher, some sand dollar money, and a comb made of a deer's jaw. Joe was properly appreciative and gave us a little speech and then cut the ham. A jolly meal was had by all.

After dinner I worked on specimens and then Alex, Al and Al, and I took out the try net. We captured barrels of sand dollars and a couple of agonids and an ophiethid eel. It is now 11:30 and I wish to go to sleep.

September 5, 1952

Blanca Bay, Baja California del Norte, Mexico

The first operation this morning was to land on the beach adjacent to the ship and make a few seine hauls. We inadvertently left Joe behind and he later gave us hell for this. The water was warm and the skies clear so it was a pleasant job. Rowing through the surf was fun. We took some 6 to 7 lb. spotfin croakers and big corbina. We returned to the ship for lunch and returned to the beach for a hike and a swim. Al anchored the tender and we swam ashore while Howard and Al Ebeling rowed the little skiff in. (Al Ebeling shall henceforth be referred to as Chuck.)

Al and Howard and I put on our clothes and hiked toward a wide canyon we could see across the salt marsh that lies behind the beach. As we hiked up the canyon we saw signs of deer, cirios, and cardon cactus. *Lycium* and some unidentified shrubs carpeted

the canyon floor. Shells were everywhere, possibly midden material and possibly reworked Pleistocene fossils.

High above a rocky cliff we noted a buteo hawk (red shouldered??) resting motionless in the air. He jockeyed for balance like a man walking a tight rope. His tail shifted nervously from side to side. At times he was completely motionless. Then he nearly completely folded his wings and swooped down as if to land on the tip of an agave stalk. At the last instant he opened his wings and soared upward again on a wind current. We watched him for six or seven minutes and then continued on up the canyon. Far ahead we could see the greenery of sumac plants and scattered Joshua trees. Under one of these latter plants I caught an emaciated alligator lizard (*Elgaria multicarinata*). I was across the canyon when Al called me. I hurried over and he stood before a five-foot cubical boulder of stone. On it were dozens of petroglyphs. There were swastikas, men, and many other unidentifiable (by me) objects represented. I took a photo as did Al and Howard. Signs of water were everywhere—mosquitoes, petroglyphs, white-winged doves, Bewick's wrens, and then we jumped three black-tailed does that had been bedded down in a big dense sumac bush. They were within 50 ft. of all of us and ran gracefully away up the rocky hillside. A trail follows the east side of this canyon. It may be an old Indian trail. The canyon bent around and opened into a long, broad canyon going into the interior. It appears to have been an important Indian route. We could see a forest of Joshuas and cardons and distant ranges of bluish mountains far up the broad canyon. Dust devils kicked across its floor.

We had to turn back because we have to load the boats onto the *Orca* today. The hike back was uneventful. We were hot and dusty when we reached the beach so we took off our clothes and dove in the clear water. Al and I tried to grab hold of the tips of bat ray's tails. These rays were common and about three feet across the wings. They always flapped off before we could touch them. Jackson and Chuck had had a couple of tussles with big black sea bass that took their bass away.

Back on board we loaded and washed down the skiffs and I worked on the fishes and got everything in order. I am sleepy. Tomorrow we go north to Punta San Carlos.

Up at 7:00. Shortly after breakfast we shoved off for Punta San Carlos, 55 miles to the north.

We put the dredge over the side in 22 fathoms of water. Joe had a field day getting the operations underway. I was sleepy and tired so I tried to steer clear for a while. Just as we hauled the dredge aboard the bottom line opened and dumped our haul—too bad as it looked good.

The next haul was taken about 10 miles to the north off [?] Rocks. We collected many interesting invertebrates and good series of typical bottom fishes. On the last haul off Punta Escarpada we brought in a vast amount of green sand and very few fishes. The winch [?]ostat burned out and the wire became kinked. The *Orca* is equipped with a special 7,200 lb. test spring steel wound strap cable. It is of very small diameter compared to the average cable of similar strength.

We came to anchor in San Carlos Bay about 3:00 PM. A low rocky point that is an island at high tide juts out to form the point. The bay is a crescentic one lined by a series of cobble beaches and small rocky points. The shore is a much dissected series of hills and peaks forming the foothills to a 2,000 ft. bluff capped by an old lava flow. This

bluff extends southward at least 10 miles to Punta Escarpada (bluff in spanish) and ends at Santa Catarina Landing, the old port for shipping onyx from the El Marmol mines.

The night is a beautiful one with the huge dark form of the bluff, a near full moon, and a calm bay and clear warm night.

Night fishing produced some sharks (one a sharp-nosed shark—*Scoliodon*). I worked up the collections and am about to go to sleep. Tomorrow we go by tender south to Punta Escarpada.

September 7, 1952

Bahia San Carlos, Baja California del Norte, Mexico

We unloaded the boats and then went in for breakfast. After this we loaded the big skiff with diving and collecting gear and started off to Punta Escarpada on glassy seas. This point is a big bluff 6.8 miles south of our anchorage. We found no good poisoning spot and had to work on a surge washed reef which proved to be not particularly productive.

Dozens of Heermann's gulls patrolled our poisoning area and "ganged-up" on the few Western gulls that wandered in. I did not use the diving gear but collected with fins, face plate, and collecting net.

We ate lunch and picked up a few more fish and then made a wet trip back (the wind had kicked up a considerable chop). After a fine chicken dinner, Al, Chuck, Alex, and I took the try net out around the ship with good results, bringing in three kinds of flat fishes, [?] midshipmen, and a sculpin (*Artedius notospilotus*). After dinner we shot the breeze with Joe and worked on our fishes.

Insert September 8, 1952 [can't locate it]

September 9, 1952

Bahia San Carlos, Baja California, Mexico

Up at 7:00 AM. We loaded the skiff with our diving gear before the breakfast gong sounded, in preparation for our trip to Punta San Fernando. After breakfast we all piled in the tender. The wind had picked up from the northwest and we knew it would be a wet trip. We obtained a couple of canvasses and huddled under these as we started out, bucking the chop. When the tender rounded the point of Punta San Carlos it ran into large swells, partly a product of the main sea swell and partly composed of water pushed up over the shallow reef. Water poured over the bow constantly. I sat in the foreward seat with Al. We both were soaking wet shortly. The canvas saved only to break the force of the spray as it was not in the slightest waterproof.

The engine kept cutting out on a couple of cylinders as water got on the plugs. We would slow down and the motor heat dried off the plugs and it would cut in again. Far in the distance we could see Punta San Fernando jutting out. Our progress was so slow Al didn't think we would make the point. I could only see it once in a while when I could see through the rain and salt water. Finally we came upon a big kelp bed and it was remarkable how it broke the wind chop and seemingly the swell too. Once we left its lee we began shipping water again in considerable amounts.

Finally we came into the south end of San Fernando Bay and knew we would make it into the lee of the point. After what seemed like an interminable run we came

into a lee from the sea swell but not from the wind, which continued to whip around us, cutting the tops off of breakers on shore and sending them over the sea as sheets of spray.

There was no place where we could work; the cliffs were all of sandstone and there seemed to be no good reefs, the water was very murky and swells were big, in addition to trying to work in a 20 to 30 mile wind. We anchored and tried to huddle down out of the wind. The surf was too forbidding for any of us to attempt to go ashore. Al and I crawled into the motor cockpit and were warm and out of the wind. Incessant moaning from the others finally caused us to trade off. Charlie tried to get in. He is about 6 ft. 2 in. and well built and he took up all the space, deposing both of us. The groaning ceased at once. We ate lunch and waited, hoping the wind would drop. Finally, it appeared better so we started back. The little tender skidded down the big swells but we didn't ship water as we had when bucking the swell. Our two skiffs in tow were the main concern as they whipped and jerked about.

We saw many medium-sized terns with white tails and a black line through the eye and a white cap. I think they were Forster's terns, but they may have been common terns. We noted large flights of shearwaters with whitish underwings. At Punta San Carlos we went way out to sea and thence directly in to the anchored *Orca* to avoid the waves at the point. The sea was spotted with big white patches of foam and the swells were sizeable. We were glad to reach the ship and get in and out of the storm. Joe greeted us with an "I told you so" sort of reception, which didn't please me much. Later the wind continued to pick up so we stayed on board and did no fishing.

September 10, 1952

Bahia San Carlos, Baja California, Mexico

Directly after breakfast we jumped in the tender and then we had to wait for Joe, who was going with us to poison a nearby kelp bed but who had disappeared below. I was quite impatient by the time he appeared as I wanted to get our work done before the wind rose.

Five minutes after he jumped on board we were at the poisoning spot. Chuck went down for reconnaissances with the lung. We poisoned a nice rocky ledge in the kelp bed in 20 to 25 feet of water. Surface water was 17.8 degrees C. but the water from the bottom up 7 to 8 ft. was close to 12 degrees C.—definitely frigid to work in.

I put on a rubber suit to cut the cold and took a 3 tank unit down. The place was a beautiful series of potholes and caves and ledges covered with coralline algae, big gorgonian fans, and bright yellow sponges. Rockfish (*Sebastes auriculatus*) and sheephead (*Pimelometopoa pulchrum*) were everywhere. I found some cottids (*Artedius creasii*, *Orthonopias tra*—[?]), a horned shark (*Heterodontus*), and a small toad fish (*Liparis mucosus*). Connie captured a live ronquil (*Rathburnella*), a rare little fish usually taken in deeper waters. By the time we had finished the wind had picked up to the point where we could barely row the laden skiff with two sets of oars against it. Once again we were glad to get back to the ship. I read most of the rest of the day an exciting book, *The Study of Instinct*, by Niko Tinbergen.

Tomorrow we load our ship's boats in the calm of the morning and proceed to San Martin Island and Hassler Cove, which we hope will be unoccupied.

September 11, 1952

Hassler Cove, San Martin Island, Baja California, Mexico

We were up at dawn in order to load the boats while the sea was still calm. Once we had completed loading (the tuna tender is the hard part) we stood out to sea into large NW swells. The wind was light. We cruised along pitching rather hard until we came into the lee of San Martin Island, about 1:30 PM. I stood a couple of stints at the helm (our automatic pilot is shot) and spent the rest of the time sacking out in the sun on the afterdeck as I had just a touch of mal de mar.

We anchored in 8 fathoms ahead of an abalone canning boat in Hassler Cove. We have a good lee from the swell but get some of the wind that whips around the north side of the island.

The large skiff was put over and Joe, Al, Howard, and I went ashore to look the place over. We landed on the sandy beach of the sand spit near 3 fisherman's shacks constructed on the hill. Two Mexicans were working on lobster traps.

We hiked over the spit to the south to the little circular lagoon. This lagoon is contained from the ocean by a high berm of big volcanic cobblestones and has a 35 ft. wide entrance. Pelicans and gulls rested on the calm surface. The water looks fairly deep. On one side little points of lava extend out into the water. Two sides are bounded by smooth sand beaches.

The main portion of the island is formed by two cones of considerable size and their attendant lava flows. This lava surface is extremely rugged and full of deep crevices. The slopes are vegetated by an almost impenetrable jungle of 4 foot high *Lycium* bushes heavily bedecked with lichens. Amongst these bushes are numerous *Opuntia* cactus plants and on the surface a carpet of iceplant. A big white *Dudleya* with a circlet of long flowering stalks was common, as was a green Hydrophyllaceous plant with dead, scorpioid cymes of a flowering season past.

I captured 4 specimens of *Uta martinensis*, which turns out to be a good subspecies of the mainland *Uta stansburiana* and nothing more. Its pattern is a bit more bold and its colors a bit brighter but that appears to be all. A bit of digging in the dunes of the sand spit produced no silvery footless lizards (*Anniella*).

I talked to the two Mexicas and they informed me that no guicos (*Cnemidophorus*) lived on the island but that a bejori (*Sceloporus*) did as well as a corallilo (king snake) which they described as having bands of brown and yellow. Al Allanson and Howard Harper found some snake vertebrae and a snake track and the tail of an alligator lizard (*Elgaria*).

I hiked north of the sand spit along a narrow trail following the shore. Debris of wrecked ships was everywhere—engines, fuel tanks, planking, barrels, etc. On the north side of the island is a rookery for gulls and cormorants as well as for sea lions. The birds dot the hillside far up the slopes toward the crater.

I met Joe on this trail and he showed me some harbor seals and pups and a pair of yearling elephant seals. We sat down on a rock about 10 feet from these big beasts. They looked disgustedly at us out of their round, pupilless eyes and hissed at us in disgust. They didn't go into the water but remained watching us. We left and on the way back passed a cormorant perched on a rock a few feet from the trail. His upper bill was bent grotesquely sideways. He didn't offer to move but merely blinked his eyes at us and gaped. The bill was healed and the bird looked otherwise healthy.

As we walked down onto the beach by the skiff the siren on the *Orca* wailed, signifying that dinner was ready. Al and Howard walked up. They had been in the crater and reported it large with a fissure in the bottom. This later proved to be a fish tale designed to lure us up the rugged peak. We rowed back to the *Orca*, had dinner, dipnetted, prepared specimens and notes. Tomorrow we poison the kelp bed.

September 12, 1952

Hassler Cove, San Martin Island, Baja California, Mexico

After breakfast we went ashore near the beach and commenced poisoning operations. Connie had a cold so I spread the poison. I saw very few fish as I was placing the poison and was not very enthusiastic over the possibilities of the collection. However we collected 25 species including one warm water fish I believe (*Neodisius stephensi*-paratype).

I had to do nearly all the diving as Chuck did not have a rubber suit and no one else was diving. The water was 16.4 degrees C. on the surface and a couple of degrees colder at the bottom so he didn't dive long.

Underwater there was a series of ledges and boulders encrusted with coralline algae, sponges, and tube worms. Many columns of kelp (*Macrocystis* and *Egregia*) rose from the bottom giving the impression of swimming through a dense forest. Parts of the bottom were covered by a dense growth of eel grass. When swimming through this, one could see only a few inches in front. I happened on small open patches occasionally and big opal eye (*Girella*) dashed into the grass from most of them.

Out on the sand at the edge of the rocks the bottom was littered with fish. Little flesh-colored cottids (*Artedius creaseri*) and hundreds of brightly colored klip fish (*Gibbousia*). After returning to the boat I couldn't repress shivering for 10 minutes or so. I had been under water nearly 45 minutes.

After returning for lunch we made a few hauls with the try net and then went ashore. Joe and the Captain came marching down the beach and Joe was carrying a gopher snake. I, of course, would have liked the animal as I was collecting on the island. I told Joe so and he said "Hell no." He was going to give it to Klauber. He asked for something to put it in. I said I had a box but that he would have to give me the snake first (joking). He said, "Give me the box or I won't allow you on board." So, I gave him the box. I went off collecting and captured some nice specimens of *Uta martinensis* and an *Elgaria*. I saw snake tracks.

Then Al came down the beach clutching a gopher snake about twice the size of Joe's (Joe had returned to the ship), and gave it to me. I was very pleased to show it to Joe when I got on board. Joe was crestfallen as he thinks it may be new. I think it is not new. I had showed the snake to the Mexicans on shore and they said it was not the banded snake they had previously described. They called the alligator lizard "ajolote". They were collecting owl limpets which they called "lapas" and said were fine eating.

On board we ate a fine hamburger steak dinner and worked on specimens. Our species list now stands at 101 species.

September 13, 1952

Hassler Cove, San Martin Island, Baja California, Mexico

Our first venture this morning was to pile the seine in the big skiff and tow it (the skiff) and a smaller one to the beach. We let Joe off on shore and cruised around the boulder breakwater to the narrow entrance to the little circular lagoon. We anchored and rowed the skiff into the lagoon over the shallow entrance. Pelicans and gulls flapped off the calm water producing a complex series of interlocking rings on the surface. A sea lion swam past us and out the entrance. Joe bellowed advice from the beach. We landed and piled the seine on the skiff. Howard and I set the net while the others horsed around and skipped rope with the end of the line.

Our haul produced bales of dead eel grass (*Phylospadix*), many gobies (*Covelandia*), and hundreds of young opal eye (*Girella*). I could see that further hauls would produce little else so we loaded the net and returned to the *Orca*. After lunch, Al, Connie, Howard, Chuck, and I went ashore. All of us but Connie hiked around the north side of the island.

We stopped to look at one young elephant seal lying on the lava beach. He looked at us with a baleful eye and reluctantly slipped into the water. I counted 16 harbor seals in the water in one cove. These curious creatures watched our every move with their round heads protruding from the water.

We noted black turnstones and a wandering tattler flying along the rocks of the shore. Hundreds of gulls and cormorants left the rocks as we approached. The northwest side of the island is largely vegetated by ice plant (*Mesembryanthemum*).

Large dusty open patches checkered with innumerable gull and cormorant footprints and guano-whitened rocks indicated that this area is a permanent rookery. Young cormorants, just too young to fly, ran in frightened troops up the hill and over bushes at our approach.

Over the 40-foot lava cliffs we saw the remains of a large ship on the rocky beach. Winches, generators, motors, decking, and all sorts of unidentified wreckage is strewn along the coast for ½ a mile. Big swells swept unchecked through the dense kelp bed that circles the north and west side of the island, and crashed in big curling breakers against the cliffs. The water was so clear one could look into these waves as they rose up like looking in a window. Kelp columns and long riatas of the feather boa algae (*Egregia*) swept up and waved in the clear water. Rocks and eelgrass could plainly be seen. Offshore, sea lions rested in the water, their flippers raised out of water as the animals lay on their sides. So many sea lions were lolling in the water that their flippers looked like a peculiar forest. One fellow swam along with his flipper out of water, looking for all the world like the dorsal fin of some malformed porpoise.

I caught a young gull for a picture. Al and I decided to hike up to the crater and Chuck and Howard wanted to go around the shoreline. We all went up to a big white rock—we, on our way to the top, and Chuck and Howard, for reconnaissance. Al ran a young cormorant down and captured it. It was a double-crested cormorant (*Phalacrocorax penicillatus*), having a dull yellow throat pouch. Howard saw a cave and before we could get over to it he was shouting various things about it having no end and being big.

The entrance was at the rim of a small crater slightly south of west of the main crater and about 300 to 400 yards distant. The tunnel was high enough to walk in, stooped over, and had a dirt and boulder floor encrusted with bright green moss near the

entrance. The rock of the ceiling and walls was blackened as if with soot and encrusted in places with a fine hairlike mesh of pinkish moss or mould.

Al went in first, feet first, feeling his way along. His expletives became stronger as he went deeper and found no end. It was obviously a large lava tunnel, a conduit for molten lava surrounded by layers of cooler rock during the volcanic activity of the island. It might well continue for a long distance.

We went in 50 to 75 yards until the light from the entrance was but a small fleck in the pitch blackness. A smaller tunnel joined ones coming in from the side and going upslope. The tunnel grew larger until we could stand and barely touch the two walls. I wailed at the canyon branch to be sure we didn't take the wrong turn on returning. Chuck and Howard and Al went a short distance farther until Al's matches were gone. A gentle cool draft of air could be felt coming up the tunnel.

Howard was all for returning to the *Orca* for line and lights but we didn't have enough time.

Outside we investigated a big osprey nest and I had my picture taken while sitting cross-legged in it.

Our party split and Al and I went up the mountain. We passed over some other lava tunnels but did not investigate them.

We noted that as we walked among the cormorant nests and the parents flew away, the nearby gulls closed in immediately and attacked both eggs and young, breaking the eggs and eating the young.

The crater is a symmetrical cinder cone 497 feet high. When we scrambled over the rim there was Alex sitting there. He had hiked up the other slope.

The crater is not too impressive, being about 50 feet deep and about 50 yards across. The view however, was worth the climb. The sand spit was particularly interesting as it resembles the spit of San Nicolas Island. [Drawing.]

Fog closed in and we hiked down the east slope over jagged broken lava flows. All the rocks were so densely covered with grayish green lichens that it felt like walking on a heavy carpet. We crossed one big lava channel and one could well imagine the glowing lava river that must have flowed down this precipitous slope. As we approached the shoreline the vegetation increased and we had to break our way at times. I caught an alligator lizard under some flat pieces of lava.

We launched our skiff and returned to the *Orca* where no one believed our tale about the tunnel.

Dinner, notes, washing and loading boats, and general discussion occupied our evening. Up tomorrow early to shove off for Todos Santos Islands.

September 14, 1952

At anchor off S. Coronados Island, Baja California, Mexico

Up at dawn for a day of quiet uneventful cruising. We started out in a thick fog which lifted toward afternoon enough so we could see three or four miles. Joe decided we should not anchor at Todos Santos as he had never been there before. How he ever anchors in a completely new place the first time I don't know.

A word or two about Joe. He is a lonely old man and I can understand why. He is intelligent, individualistic, and highly fixed in his ways. He is self-centered and often

quite rude. To get along with him one has to back water on many points, agree with his decisions and ideas for there is no chance for discussion or controversy.

He is extremely frugal in some ways and rather lax in others. He saves tin cans, string, and old boxes, but he feeds us quite well and offers the use of his ship for free. He insists on keeping a neat ship and works very hard maintaining it himself. He has a good sense of humor and tells a good story, but he tells too many and even the good ones are tiring. He has the habit of cornering a person to talk to them. This is highly odious to me. I found his ship very well arranged and equipped for our work. It is fairly difficult to carry out an operation under him, in particular if he is in a position to be boss. He is the sort of boss who tends to every detail and each in loud excited tones. There is no relaxation and no free and easy air on board. I would rather not travel with him and particularly on a long trip.

We dropped anchor after dark off S. Coronado Island. It is a beautiful starlit night and clear and sparkling.

September 15, 1952

La Jolla

We were up at dawn, crossed the channel, and came alongside the fuel dock at the Harbor Boat works in mid morning. Everyone was glad to get back.

September 24, 1952

Avalon Harbor, Catalina Island, California

Yesterday evening we boarded the *E. W. Scripps* by going through the surf at Scripps in the DUKW. This amphibious beast plows right through the surf with no trouble.

We are accompanying Otis Barton and party in his attempt to break the record for the deepest dive into the sea. He holds the present record at somewhere near 5,000 ft. One or two of our party will go down in an attempt to look at the organisms composing the deep scattering layer.

This layer is a diffuse layer of some sort of organic material, which migrates up and down with the diurnal cycle. It migrates upward from 200-400 meters at dusk toward the surface. What animals compose it is uncertain at present.

Our party is composed of myself in nominal charge, Andy Rechniter[?] (who will probably do the diving as he is our ranking deep sea fish specialist), Dave Arthur, who will go down to identify invertebrates, John McGowan, his alternate, Ed Brinton, an invertebrate specialist who is along for the observation, and Jim Kittredge, biochemist, who is also along to see the show.

We sailed to Avalon Harbor, arriving about 12:00 PM. We anchored and John, Ed, Dave, Andy, and I went ashore and swilled down a couple of beers. Avalon is quite dead at this hour. The tourist season is largely over and the total population is probably two or three hundred.

We arose about 7:00 and proceeded southward in company with the *Monsoon*. This boat is a yacht owned by Jack West, an advertising executive. The ship is a converted aircraft rescue boat and looks like a splendid craft of 75 ft. or so. On board are several newsmen from *Life* and *Time* magazines, various photographers, Dr. Maurice

Nelles, who is in charge of the operation, and Otis Barton. Nelles is an engineer in the employ of Bog-Warner Instrument Co. Otis B. says they manufacture "mechanical mechanisms". Nelles runs the operations with a iron had and bosses Barton around like he was a little child.

We cruised south of Catalina Island about six to seven miles and there met the Harbor tug *Pacific Rocket* and the crane barge *Cherry Picker*. The *Pacific Rocket* is a top heavy rust pot and has been renamed by John McGowan—the *Pacific Bucket*. He has also dubbed the benthoscope the "proctoscope". The cast steel ball called the benthoscope was sitting on the barge when we arrived. It is very much like the older bathysphere, though of better design and greater strength. The benthoscope is a sphere 54 in. in inside diameter bolted to two wooden runners and reporting a long fin and rudder [drawing]. There is remarkably little room inside and *Life* magazine men have crammed a complex automatic stroboscopic camera inside with all its attendant power packs and gear. There are oxygen bottles (enough for 60 hours or so), barometer, thermometer, a small fan, gas absorption chemicals, a light, and the diver.

Barton was put down about 25 feet to test out the gear. The big winch is not used at first as the benthoscope is first swung over the side on a big crane and then, after the ball is lowered 25 feet, is switched to the main winch. The main cable is $\frac{3}{4}$ in. steel and is attached all the time. The crew operating the winch and unwinding the electric wires are a competent lot and inspire confidence. They work quietly and with precision.

Otis, on the other hand, is excitable and seems to get his thumbs into things. He kept having his fan shut off and the window fog up, and various other minor complications.

Nelles, a quietly efficient man, gave orders over the telephone system, carrying on a constant conversation with Barton. At one point he gave instructions as follows: "Now Otis, turn off the fan switch. Now Otis, take a bit of paper on the ends of your fingers and wipe the glass carefully. Don't smudge the camera mirror. Now Otis, put your hands in your pockets; leave them there." Otis made no intelligible reply. Barton is a fairly tall bald-headed man with a small mustache and a bit of a leer on his lips. He is quiet and seems somewhat nervous and excitable. He knows the names of some organisms though he talks of "globs of gunk" and "fiery dragon fishes". He is not a scientist but designed the original bathysphere and then lost most of his glory to William Beebe, who accompanied him on many of the early dives. He is naturally a bit bitter about Beebe and is now writing a book entitled *One Mile Down*, a sort of answer to Beebe's *A Half a Mile Down*, I suspect.

The barge was fairly swarming with camera men. Jay Eyerman, of *Life*, is in charge here. He is a likeable sandy-haired fellow. Also from *Life* is Sandy Thompson, a little bald-headed, red-moustached Scotsman. He is a jolly sort and has a good word for all occasions.

The benthoscope was sent down 100 ft. and brought aboard without making a deep dive. Tests run yesterday had finally stopped leaks around the quartz glass ports after the sphere had entirely filled with water on one occasion.

I might note that an egg and a can of beer are suspended from the fin. The egg has already survived being lowered to 2,000 ft. without breaking.

As a chop had come up we returned to the *Scripps* and thence to anchor off the old Casino in Avalon Bay.

Ed, John, Jim and I went ashore in search of amusement. There was not much to be had but we settled down in one of the local spas and had a few beers. A cadaverous, seedy-looking individual joined us in song at the piano and later launched into a discussion of nature foods. It seems he had seen the light some years ago and was now natural. John, he decided was natural too. John has a beard, which adds, I am sure, to his naturalness. Try though I did, the best I could achieve was a pat on the back and a few words explaining that with proper application I too could become natural. Jim Kittredge, who insisted on watching the television set was beyond the pale and obviously had no chance to achieve naturalness.

I found that 1) women are natural, 2) sex is natural, 3) uncooked vegetables are natural, 4) television, autos, insurance, police, and the general American public are decidedly unnatural. With this bright future before me we rowed back to the ship and climbed below to our bunks.

September 26, 1952

Avalon Bay, Santa Catalina Island, California

We followed the *Monsoon* and the *Pacific Bucket* (with *Cherry Picker* in tow) to south of the island and began operations. After some testing Otis entered the sphere and was lowered over the side. I took the job of laying out electric cable before it was tied to the steel cable suspending the ball. One man ties this wire to the cable as it is payed out in 20 to 30 ft. lengths.

Otis reported that he could still see the image of his camera in the port at 871 feet. Below 1,000 ft. he began to see various flashes of light and described some long light chains and blobs. He took many photographs with the strobe camera but had no flood light so could not identify any organisms. Once he identified a piece of ice floating by (at 1,500 ft.). We decided it must have been heavy water.

He reported oxygen pressure and barometer reading to Nelles at the surface at periodic intervals. The ball was lowered to 2,000 ft. and he reported that the temperature was 42 deg. F. inside the ball at that time. It took a long time to raise him as the electric cable had been twisted by the rotation of the sphere as it descended. Each tie had to be cut as it came to the surface.

Otis had gone down in his shirt sleeves and was a mighty cold fellow by the time he came to the surface. The dive took about three hours to make. After lunch we returned to the *Cherry Picker* but Nelles called off further operations on account of choppy seas.

Andy had to return so we sent him in on the television boat. He had been very silent and obviously much worried over his projected dive. Once he knew he was not going to dive he became jovial for the first time on the cruise. Either Dave or I will now make the first dive. We will flip to see who makes the dive. I continue to get more excited over the prospect. A good job of observation might prove quite valuable.

We returned to Avalon and anchored. Several of us had a nice swim in the warm clear water. Dave, John, and I swam across the harbor to the pier at the center of town.

Later I took the skiff over to the *Monsoon* and visited all the people on board for a while. We then returned to the *Scripps* for a guided tour. Then I sailed the skiff around the harbor. It is a beautiful moonlit night with broken clouds scattered across the sky. The lights on the bay and the boats rocking at anchor created a calm and magnificent scene. I

spent a part of the evening writing notes while the others were ashore soaking up a bit of beer.

September 27, 1952

San Clemente Island, California

We knew that Barton was going to make a shallow (1,500 ft.) photographic run this morning so I told Gus there was no need for us to rendezvous early in the morning with the *Pacific Bucket* and the *Cherry Picker*. So we started out at 8:00 AM and cruised down the precipitous SE shore of Catalina Island. Just after we cleared Land's End I heard the *Monsoon* talking to the *Pacific Bucket*, saying they were going into Avalon to pick up a new oxygen flow valve. I cut in and found that the valve had been damaged when the tug banged into the barge, knocking Nelles off his feet. He was holding the valve and it was bent in the fall.

No valve could be obtained in Avalon so frantic calls were made to the mainland to obtain one.

It became obvious that we would have no chance of diving today so Gus took the *Scripps* in close to the *Monsoon* and, after considerable conferring, John and I decided to go aboard the *Monsoon* while the others returned to San Diego. We could not keep the *Scripps* out longer.

We were all a little bit unhappy at the slowness with which this operation seems to move but it really is unavoidable and I feel happier considering Nelles' cautions.

The *Monsoon* is a far cry from the *Scripps* in some ways. There is beer in the ice box and everyone is constantly clutching a highball.

Much conversation of this and that—a good swim in which John and I each recovered a sea cucumber from 25 ft. by surface diving.

The valve arrived and we immediately upped the anchor and sailed for Wilson's Cove on San Clemente Island. We arrived before dusk and dropped anchor near a pier (air force or navy). On the hill are a number of buildings of several kinds—barracks, store houses, etc. A couple of fellows came out in a skiff and challenged our right to anchor. Jay Eyenman said we had a signal letter for Admiral Frou-frou permitting us to do so. Without asking to see the letter they departed.

We ate dinner and yakked of this and that and went to bed.

San Clemente Island, at this cove, looks volcanic, at least in part. There are two good terrace levels in evidence, one at about 20 ft. above sea level and another at 75 or 100 ft. above the sea. The hills are rather low at this end so it is impossible to note any higher levels.

September 28, 1952

San Clemente Island, California

The *Monsoon* got underway before dawn this morning and proceeded to the deep trough south of San Clemente Island. There we boarded the *Cherry Picker* and the benthoscope was soon lowered over the side empty. Nelles had it run down to 5,331 ft. before he stopped it. There was only one row of turns on the drum. The sphere was hoisted and brought aboard dry. One of the lights had been smashed but the benthoscope had withstood its test well and I feel it will make its descent well, providing Barton doesn't foul something up. At one point I saw him doing a sort of dance on the stern of

the barge, as if from nervousness. John and I have decided we will not go down unless we do it together without Barton. I think he increases the risk at least 100 times. He seems determined to meddle with the equipment and likes to change things around while he is down.

At about 1:15 PM the benthoscope was lowered over the side for the deep dive in which Barton intends to go 5,280 ft. Before the door was clanged shut I poked my head in and Barton said, "There's plenty of room here (pointing to the deck), you can come in now." I had to convince him that I had no intention of going on this particular dive.

He was lowered to 2,000 ft. or so and reported "clouds of limy flakes" in the water at about 1,200 ft., or the depth at which we would expect the scattering layer to occur. Try though we did, we could not get any more information out of him. His lights went out and we could see the wind was picking up so it was decided that no attempt would be made to make the deep dive. Dr. Nelles did not think it wise. We all got back on the *Monsoon* and headed for Pyramid Cove and anchorage.

September 29, 1952

La Jolla, California

We upped the anchor before dawn and proceeded out to the Clemente Basin. Very quickly the camera gear was checked and Otis entered the benthoscope. He was bolted in and swung over the side. Seas were as calm as a lake, not even a wind ripple was in evidence. Otis saw hatchet fish larvae and other creatures including small crustaceans. He took a considerable number of pictures. Everything went well for a while. John and I are ready for our dive to follow his. We have a detailed observation procedure planned. I will observe on the way down and John on the way up. We have a can of beer and an opener and are going to drink a toast at the bottom. I know John is now engaged and I will announce this at the bottom also—drinking a toast to him in Schlitz, and to his bride to be. This plan is quickly forgotten at the time Otis is down 3,331 ft. He says over the phones, "Oh, Dr. Nelles, something is wrong. Dr. Nelles! Dr. Nelles!" Then his voice cut off completely and contact was lost for good.

We immediately began to bring him in as fast as was possible. The entire crew worked with tremendous precision and speed—cutting the ties that hold the electric wire to the steel cable as they flashed out of the water and toward the big pulley and eye through which the cable passes onto the drum. The winch engine was soon steaming and boiling. Everyone was tense. We felt that chances were 50-50 that Otis was dead as we knew something was wrong in the ball and it would take us at least 40 minutes to raise him. I found that every newsman present had a byline prepared in case Otis had been killed. Photographs even had been taken of the ball for this purpose.

Finally the electric cable became so tangled that it had to be cut loose. Shortly we hoisted the ball on board and could see at once that it was not full of water. A light burned inside the port from a battery. The bolts were feverishly loosened and a hand with a flashlight came out the port. Otis was OK. He yawned and announced that we had awakened him by banging on the bolts. He had gone to sleep! Curled up in a blanket and gone to sleep!! He did not take a single picture on the way up!

Nelles was so tense that he called off further operations, deciding he could not send us down with a patched cable.

John and I were quite disappointed as this was our last chance. We despondently boarded the *Monsoon* and headed for San Pedro. Jay Eyeran and Frank Champion put us on a plane (from their expense account) and off we went for San Diego, a good meal, and La Jolla. Bah!

October 24, 1952

San Miguel Canyon, Baja California, Mexico

Al Allanson and I set out this morning on a trip scheduled to last eight days. Our main purpose is to collect fishes in some of the streams in northern Baja California. It will take us eventually to the crest of the Sierra San Pedro Martir and up three of the canyons.

We left La Jolla at 6:00 AM and had a good breakfast in San Diego and shortly crossed the border into Mexico. Out a short distance on the Rodriguez Dam[?] Road we cut down to the Tijuana River. It is a slow, meandering stream formed of several small rivulets flowing through a reed-filled river bottom. It is a mess, with beer cans, trash and bottles, old tires, etc. in the stream. We seined in this and retrieved a series of green sunfish and mosquito fish.

We saw some larger fish with a lateral dark stripe swimming in a large pool but were unable to catch them with our little common sense seine. We went back to the car and unlimbered our 25 ft. bag seine. We soon caught our mystery fish which proved to be a small mouth bass. A large carp eluded our net.

We tried to find a way to get to the lagoon portion of the Tijuana River, near its mouth, but only succeeded in finding a place where the International Border fence had been knocked down and people were blandly driving across and coming out in the main highway at Dairy Mart Road, in San Ysidro California. We crossed at this point twice and no one bothered us. The dope traffic must have an easy time.

We returned to Tijuana and went upstream near Rodriguez Dam. There we saw only more of the same species we had been taking, including several more bass. After a couple of beers we drove on down the road toward Ensenada. Before long we came to San Miguel Canyon, and we cut down the embankment beyond the old mission, past a house with abalone door knobs, into the canyon. It is a magnificent canyon with high, nearly vertical basaltic walls, a lazy little stream choked with watercress, reeds, and algae, and banks bordered with dense grey-green thickets of willows and arrowweed.

Cottonwoods and sycamores form a patchwork in the streambottom. We followed a white sand road up the canyon past a lone palm and a lone pepper tree to a ford. Here we stopped for lunch. The day was cloudy and cool but very pleasant. We had two captive rattlesnakes which we set free, one a small Pacific diamondback and the other a young adult red rattlesnake. Both were soon lost in the underbrush.

We seined in the stream at this point and caught a good series of *Gambusia* and *Fundulus*. We continued on upstream passing first through a gate on the left hand side of the stream, past a group of Mexicans shucking corn and on up the canyon amid oaks and sycamores.

The walls of the canyon closed in somewhat as we proceeded upstream and then opened out into a broad hidden valley. It is a beautiful place, rimmed with hills and covered with fields of cornstalks, wheat stubble, and lush grape vines. We hiked up a

side canyon to the left under a canopy of huge, spreading oaks. We followed a road to its end in an oak-covered flat just beyond a corral made of woven willow staves.

Once back down we drove on up the valley through fields of grape vines to a couple of adobe ranch houses. Afternoon was closing as we drove up a nearby mustard-stalk-covered slope in search of a dam we had heard existed on this stream.

On the way up Al and I shot three doves with our 22s. We will cook them later. Finally we were stopped by the steepness of the hill; the wheels of the carry-all slipped on the slick grassy slope.

We hiked over the remaining few yards of the slope and looked down on a bend of the river that formed a huge natural amphitheatre of grand dimensions. A few cattle straggled across the grassy bottom, far below us.

We returned and drove the car through the fields and out of the valley, across the stream to a little sandy flat. We were briefly stuck in sand but shortly made camp next to a tall stand of arrow-weed (*Baccharis*) about 150 yards from the stream.

Dusk was falling and the surrounding hills faded into graded shades of gray. The sky in the west was faintly tinted rose in the V of the canyon. I walked down toward the creek with my gun. The cool air made the edges of my ears and the back of my neck tingle—a delightful feeling that heightens one's acuity. The smell of river bottoms, of willows and arrowweed and bogs was heavy in the air. A great ponderous silhouette of a great blue heron flapped across the sky and a ragged line of swift doves entered the trees—birds coming to roost for the night, in from the dry hillslopes.

As I shuffled back to camp a number of noises awakened my notice from various directions. Ahead on a far slope coyotes were already yipping at one another. Ravens called garrulously to the skies from their roost in a big hillside oak. I heard the laughter and screams of small children downstream. Crickets set up a pleasant base-level for it all.

We ate a fine meal of ground round, potatoes and onions, green beans, avocado and tomato salad, and tea. A passing vaquero joined us in a drink of wine and told us of the dam two miles upstream. A good fire, dishwashing, bugs around the light, notes, and then to the sleeping bag 'neath clouded skies. Tomorrow we head for Meling Ranch at San Jose, in the foothills of the San Pedro Martirs.

October 25, 1952

Santa Rosa Valley, Baja California, Mexico

After a leisurely breakfast of french toast and bacon, Al and I loaded the carry-all and drove up the valley. We had hopes of hiking to the dam. We drove through the big vineyard and to the edge of a broad sandy wash. Al thought we could cross it and drove down into it. We shortly bogged down in the soft sand. Both of us agreed it was better to work back than to try to go ahead. We decided we needed a board or two to help us so we started hiking toward a little adobe shack on the side of the hill. After a hundred yards or so we decided to go back and get our guns, which we did. I had a couple of fine stalks after doves in the dry corn fields. Finally I got two birds and we reached the little house.

What a spot!! This little adobe overlooked the entire valley—vineyards, grain fields, and distant hills. Water was piped down to a water trough and several kinds of fruit trees grew down the slope in front of the house. Melons and squashes were ripening

among the corn stalks. Several spreading oak trees shaded the place and high rocky cliffs guarded the back yard. We saw jays, doves, and a brilliant oriole in the oaks. Al made a fine standing shot on a dove standing on a rock.

We found a surplus plank on a little willow shack and a couple of Model-T floorboards, which we hauled back to the car. After working quietly for a while we heard the calls of quail nearby and dropped our shovels and picked up our guns. The birds were not more than 50 ft. away, clucking and walking towards us. I shot one.

We pulled out and drove down the valley (it was too late to hike for the dam). We got another quail in the vineyard and drove on down the canyon. Near La Mision we noted a huge bird standing by a corral. It was an eagle with huge leg ruffs. He took off in ponderous flight and we watched him sail up a nearby canyon and disappear.

We drove to the mouth of the canyon and seined in the lagoon there, catching nothing but *Fundulus*. A net haul farther upstream netted us more of the same species. We saw a group of water birds standing in the shallow stream. They may have been yellow-legs. One lone American egret stood in the water far upstream. His white plumage shone like it was illuminated against the gray-green willows of the stream border.

We packed our seines, had a beer, and drove on into the Santa Rosa Valley and down a tributary at the southwest end. We camped near a sycamore on a little grassy flat by an old corral. Al and I took hunting hikes. I returned at dusk and several flights of quail rocketed into the oaks near me. I shot one after it was so dark I could hardly see my sight.

We had 7 dove and quail for dinner, a good salad, wine, and a fire. An old great-horned owl "wakked" in the oaks nearby. It was a foggy night, but I didn't notice it.

October 26, 1952

San Telmo River Valley, Baja California, Mexico

All night I could hear fog dripping from the tips of oak leaves and was thankful that my sleeping bag was in the open. Al cooked breakfast while I hiked around the vicinity.

The skies cleared and we had a beautiful calm clear sunny morning. We packed and drove out past the corral and gate. A short time was spent seining under the road bridge. We determined that the water does not drain into the sea from this SW tributary, but into the valley and thence in the direction of San Miguel Canyon, through a narrow gap. We caught mosquito fish and green sunfish. Before long we entered Ensenada where we bought gas, bread, and beer.

South of Ensenada we bypassed the checking station by driving through fields. Al swiped a few peppers and showed me how to eat them and how not to eat them. All is palatable and cool except the fibrous part that holds the seeds. This is hotter than hell! My mouth burned for miles.

I filched a few tomatoes and we continued on down the highway past Santo Tomas Valley, San Vicente Valley, and Arroyo Seco. 11 miles beyond the end of the pavement at Arroyo Seco we came to the San Telmo cutoff. We motored up through the beautiful winding canyon to the little valley that holds San Telmo. The village is small and surrounded by heavy growths of tuna cactus. A few *Washingtonia* palms stand in the

village and several ruined adobes are to be found. Cows, chickens, and neat Mexican girls wandered about.

Up over a dusty ridge east of the village, we drove and were greeted with a view from the crest, of the broad fertile river valley above. A huge ranch with much machinery, a big cement warehouse, young orchards, spray watering, and literally miles of plowed fields occupies the river bottom. It looks as if it could well be worth \$1,000,000.

We drove past this, hunting all the while for a ground squirrel to cook for dinner. Al saw a nice spot to camp and as it was late we pulled off and up against an agave-covered slope. I saw a covey of quail on the slope and we both went hunting immediately. Before I had finished I had three brush rabbits. We ate them for dinner with wine, salad, coffee, and corn. It is a beautiful warm calm clear night—one to be enjoyed and remembered. I will put my book down and sit for a while by our agave fire before going to bed.

October 27, 1952

Arroyo San Telmo, Baja California, Mexico

Al and I got up at dawn and set out with our guns looking for rabbits. I walked a mile or so upstream and shot two rabbits and saw several roadrunners. I returned before Al and sat down to enjoy the morning.

A shrike swooped down among the bushes chasing a young cactus wren. The pair fluttered around the shrubbery and finally the shrike pounced on the wren, holding the hapless creature in his claws and pecked at it. The wren was swiftly killed (by what means I am not sure as there were no marks on the bird, at later inspection).

The shrike impaled the little bird on the sharp twigs of the bush when I interrupted the meal. Later the shrike returned and carried off his prey.

We piled in the carry-all after breakfast and drove toward Rancho San Jose, 14 miles away. The road leads out of a broad valley and up onto barren buckwheat-covered hills. As the San Pedro Martirs are approached brush becomes more dense and scattered junipers appear. *Artemisia tridentata* (Great Basin Sage) covers hillsides and valley floors with its silvery foliage.

Two north-south trending parallel mountain ranges form the western ramparts of the San Pedro Martirs. The scarp itself is abrupt and impressive. A thick matting of pines can be seen along the crestline. The road is much improved since my last visit, about four years ago. Any car could make it now. Al was not very happy about the looks of the situation. He suspected prices for animals would be high at the ranch and he didn't care too much about the hike I prospect.

I had been excited and eager but this unexpected attitude dampened my spirits a little bit as I doubted that his feelings would change.

When we came to the ranch I could see some changes had been wrought. A new guest house had been built and Mrs. Meling's daughter was in charge. Al was quite right about the commercial air. We "bought" a beer—it was offered to us and we paid for it. A pack of four animals and a guide cost \$15 per day, not exorbitant but this would allow us only three days on the mountain.

Al was willing to spend his money but I felt he was little interested anyway so I decided to abandon the attempt this time and go up Arroyo Santo Domingo instead.

We talked for a while with Mrs. Meling. She is a wonderful person and very helpful. She drew the appended map of the mountains for us. We found that trout are well established on the top of the Martirs in several localities and that logging attempts have been abandoned in the vicinity.

On the road out we turned right before reaching the crest above the ranch and drove northward along the small airfield north of the ranch and into San Telmo Arroyo above the ranch. We stopped near a dug dry well. We hiked on up the canyon through dense plant growth toward the mountains. It was hot and calm. Finally Al and I met by a big rock outcrop and decided to hike to the next spur. The stream that flows at Rnacho San Jose is underground here and we were dusty and dry and hot. We hoped to find water around the bend. Far up a spur canyon I noted some cottonwoods growing in a cleft in the granite. I hiked toward this and after leaving a well beaten horse trail, clambering over boulders and scaling a few small dropoffs I came to a tinaja in the rock filled with greenish water and rushes. On farther the water was clearer and potable. I called Al and then set out to investigate. A big frog jumped into the lower pool. I caught him and he proved to be *Rana aurora*, the red-legged frog. There were many in the rushes and water.

Al and I caught 9 for dinner. I know the animal has been taken here before and MVZ has specimens so I took none for museum specimens. We had frog's legs for dinner. We drank our fill and lingered in the shade of the sycamore and cottonwoods. Late in the afternoon we began the hike back. I shot another brush rabbit and put two shots through a bush that looked exactly like a sitting rabbit in the dusk. It was nearly dark when we got to the car.

We cooked a fantastic-sized meal of frog's legs, salad, three rabbits, and two rusty-buts (cheewinks, brush robin), potatoes, and onions, and two bottles of wine. We both became tipsy. I raced through the brush pulling up bushes with my bare hands while Al lay on the ground shouting instructions. Later we had a plant-pulling contest and cleared a considerable area of greasewood. I retired—bloody (from many scratches) but unbowed. The healthful outdoor life is certainly the best.

October 28, 1952

Rio Santo Domingo, Baja California, Mexico

Before we had finished packing the car the !@\$ gnats closed in and began buzzing in our ears. Al stoked up a fire and we had no more trouble with them, why I do not know.

We drove on toward San Telmo, stopping a couple of times to hunt quail and rabbits. One time we stopped to inspect a big hawk which we saw sitting in a bush. It was a large bird with dark brown upper parts and a white belly and leg ruffs. We think it may have been a ferruginous rough-legged hawk.

Just before reaching the main road we stopped to eat lunch amid the agave scrub. On down the main road to Colonia Gerrero over the jouncy graded main road. It is very tiring to travel on and Al dislikes it very much. At the Colonia we bought gas and some cerveza Carta Blanca. We received directions for driving up Rio Santo Domingo. We drove up to the big arched building that looks like a theatre, to the east of the main road, cut north and just at the edge of the arroyo we turned eastward and shortly crossed the stream bed (here we helped to start a Mexican whose car had stalled). Once across the

river we drove up the north bank and shortly came to a little village shaded by many trees—figs, willows, sycamores, oaks, etc. All sorts of poultry ran loose in the streets and corn fields. How ownership is decided I have no idea. Turkeys, chickens, ducks, and geese wandered about. Many of the adobes had little kitchen gardens of green beans, radishes, lettuce, onions, etc. and patches of bright flowers. The ruins of the old mission Santo Domingo stand in the mouth of a small tributary arroyo. The walls are crumbling but doorways and windows faced with stone attest to the craftsmanship of the old Franciscan padres who directed the construction. A ditch supplies water to the village and one wonders if it was first dug under the eyes of these same men.

We continued on up the canyon on a good road between precipitous high walls. Ranches disappeared behind us as the canyon narrowed and willows, cottonwoods, and sycamores choked the river bottom. A small clear stream appeared and in one place we had to pull some Mexicans out of the river. They had a burro helping and three fellows chopping willows when we arrived. We hitched up a chain to their car and snaked them out with no trouble. We then filled the roadbed with cut branches and drove across, as did they.

As we continued on upstream the water disappeared. We passed through the dooryard of a small ranch and made camp above it a short distance next to a steep agave and goatnut-covered slope. We ate dinner and went to bed.

Home the next day via the Rio San Vicente, where we made a collection of sticklebacks.

January 1953	Colorado River Trip
March 1953	Pushawalla Palms
November 1954	Off Santa Barbara
November 1954	Baja California

January 16, 1953

Bank of Colorado, 1 mile above Winterhaven, Imperial County, California

This trip is one being carried out for the Division of Marine Vertebrates at Scripps Institution. We are scheduled to float down the Colorado River from Yuma into the Gulf of California. Our purpose is to make collections of fishes and molluscs along the course of the river with the idea in mind of shedding some light on the origin of ancient lakes which once filled the Cahuilla Basin (now occupied by the Salton Sea). These lakes have left marks of their presence in the form of shore lines etched into the rocks surrounding the basin and by deposits of fish bones and huge numbers of molluscs in the old shore sands of the lakes. Of the modern day representatives of these animals, how far upstream do they now occur? Are they restricted to salt water or could they conceivably have been introduced into the old lakes by overflow from the river? We will try to shed some light on these questions.

In Dr. Hubbs's absence I have been placed in charge of the expedition and its planning. For boat work and gear I put Al Allanson in charge. He is a wonderful boatman and a splendid companion and outdoorsman. He asked two others to go along—Johnny Fleet and Charley Snell—both are excellent men in the field and good field companions. Two others will drive trucks and pick us up at San Felipe in the Gulf and at one portage point in the river. (Ben Cox and Ted Walker).

After much preparation including a plane flight over the river and conversation with several people about river conditions, we left this morning at 6:00 AM with two trucks and three boats (two of which will be used on the river). Both of our river boats are 16-footers built by Johnny Fleet. We have 2 10-horse Johnson motors.

We drove to Winterhaven, arriving at 12:00 Noon. While buying gas a car drove up alongside of our rig. The driver was a Mr. Porter of the State Police. He struck up a conversation and when he found we were going down the river he offered to drive us to Morelos Dam so that we could see the weir over which we must pass.

Before we had gotten halfway to the dam I could see this man was a real politician. His business was having connections and doing favors. He is the district head of the state highway patrol. He waved to a dozen people at least and regaled us with all sorts of tales—how he got stolen cars back from Mexico by use of his connections, his poaching forays up and down the river—with and without the warden. He did a large part of his work by use of the people he knew apparently. It is easy to see, that if this is the general rule with police officers that graft would be impossible to ferret out of forces. I suspect this is often the case.

We saw the dam keeper and walked out to the weir. Two feet of water flowed over it and passage will be quite simple. Back at Winterhaven Al and I met the others who were talking to a Mr. Dover. This man offered to let us camp on his ranch alongside

the river. As it was on the California side this would mean that we wouldn't have to undergo the border food inspection and stand the chance of losing our fresh vegetables.

The ranch was a large alfalfa field along the muddy river. It was a fine place to camp and to launch our skiffs. We set up camp and prepared the gear for the boats. We will start early in the morning.

Shortly after we had settled down a couple of surly looking characters drove up in a jeep and asked us what we were doing. It was obvious that they "owned" the river and that we were trespassers of a sort. They had used this field for hunting and somehow had seen us.

My talks with Porter, Dover, and these two men convince me that many of the natives of Yuma and Winterhaven take a proprietary interest in their river and probably look on such as we with the sort of scorn received for neophytes. Eyes were watching us and our venture from all sides.

When we were planning the trip back in La Jolla we had not even thought of the people along the river—we had thought about tides, tidal bores, whirlpools, dams, food and gasoline and the like. Perhaps we will join their society when we are done, and establish a La Jolla chapter.

We ate a fine dinner—ground meat, salad, potatoes, coffee, and wine. Al drank more than his share of the last item and gave us a splendid imitation of an airplane and then told endless stories in a loud voice. Finally we went to bed under a bright starlit sky. The railroad noises of Yuma blotted out the ripples of the river. It froze and I was thankful to have my sweater on in the bag.

January 17, 1953

Near Gadsen, Arizona

After breakfast we launched our boats and loaded them. Shortly we shoved off into the swift current of the river. It is perfectly a perfectly soundless mode of travel, floating down a big river such as this. Quickly we left the two men on shore behind as we floated around a bend in the river. Some little Yuma Indian children ran along the bank laughing and screaming at us. We could see their clay and wattle house back among the willows. We passed under the railway bridge at Yuma and floated on down the stream between tree-lined banks. The stream is perhaps 200 yards wide on an average and lined with thickets of willow, arrowweed, tamarix, and cottonwood trees. All sorts of birds flew from the trees as we floated along. Many big black-crowned night herons were scared from their perches. Ponderous great blue herons flew away to land on teetery perches in trees, with their long necks outstretched, or stopped on the mud banks where they stood perfectly erect and became so thin that they looked like plants. We saw bitterns, several kinds of ducks, geese, coots, and all sorts of smaller birds such as vireos and savannah sparrows.

After a time we lashed the boats loosely together and floated down as a raft. What a life! We lay back on sleeping bags, took off our shirts and enjoyed the sunshine. A minimum of rowing is needed to keep the skiffs in the main current, but this chore came up only once in every ten minutes or so.

From the air the boils of water and whirlpools had looked ominous. However, on the river they presented no problem. So I am told, these boils are caused by ripples building up in the bottom mud until they are unstable and are suddenly washed out by the

current and the bottom is scoured clean. The rush of water thus released boils up to the surface. Several times these came up under our boats but did nothing more than startle us with their noise. This turbulence serves to keep the river full of sediment in suspension.

Before too long we came to Morelos Dam. It is a diversion dam used to shunt water into the Mexicali canal. This canal supplies the water for irrigation of the large and productive Mexicali valley. The dam extends only $\frac{1}{2}$ way across the river above the water surface, the eastern $\frac{1}{2}$ being a concrete weir which normally lies a foot or two beneath the surface. The western $\frac{1}{2}$ is a series of big metal gates which can be opened or closed to regulate the level of the river, part of which passes out to the west into the canal.

Johnny and I went over the weir first. It was a very short little rapid and we slipped by easily, as did Al and Charlie. I had worried about this and was glad to be by it.

We lashed our skiffs together again and made up lunch as we floated along. Al broke out the stove and we cooked up a fine pot of coffee using river water. All this keeps reminding me of *Huckleberry Finn*. I used to live that story and his raft life. It enhanced my pleasure here I suspect.

We shot a couple of coots and some doves before we began searching for a camp spot. About 5:00 PM we saw a little backwater and a little sandy clearing on the top of the bank among the arrowweed plants and screwbean mesquites (*Prosopis jubiflora*). We pulled in completely out of the current and unloaded onto the clearing. I gathered wood for a fire while the others started preparing supper.

I took a walk with the gun in hand, along an old abandoned dirt road. I saw several rabbits and covey after covey of quail but the dense brush prevented me from shooting any. As I came back to camp a blazing sunset turned the sky and the shining river pink and red and finally orange and brown. Later I was pleased to find that coots are fine food. They are easy to obtain and when rolled in corneal and fried in an inch or so of hot oil they were tender and no more gamy than a wild duck.

Tomorrow we will probably pass San Luis, Sonora and be all in Mexico. Here $\frac{1}{2}$ the river is in Arizona and the other half in Mexico. We will make our first collection too. We travelled about $7\frac{1}{2}$ hours and averaged about $3\frac{1}{2}$ knots, if I calculate correctly. We used no gas and rowed only once in a while. It is getting cold and it is 10:00 PM so I will go to bed.

January 18, 1953

South of San Luis, Sonora, Mexico

We were underway at 9:12 AM today after a good breakfast. Last night while Al and I were writing our notes we heard repeated splashes in the river. We thought they were fish or some sort of rocks or soil falling into the river. I suggested that they might be beaver but didn't really believe it. Finally, because of cold air we went to bed.

I was cold all night long and awoke only when I heard Al building a fire in the cold gray of the dawn. Next morning we ate breakfast and afterward I went on a brief hike with the gun. I saw several Gambel's quail but shot none. We loaded and shoved off into the river. Today was beaver day. First Al and Charlie spotted a beaver house and two beaver—one of which swam across the river and flapped its tail. The sound was identical with that we had heard the night before.

As we floated down the river we saw many birds including the Florida Gallinule—seen near Gadsen. This is the first of the species I can definitely say I have seen.

Before long we spotted a large flock of Canada geese standing on a sandbar. What magnificent birds!! They flew away with a rush of wings and flapped slowly off to the northwest. We passed the San Luis Bridge—a wreck of old pilings and a collapsing span. In its place was a ferry (pango) which was crowded with dozens of people all standing up. The pango itself was stuck in the river mud and men were in front of it trying to free it with dredges.

We ate lunch and made a collection in a backwater. The water was cold (12.2 degrees C.) and we obtained few fishes even though we made six seine hauls in the freezing water.

Lunch was welcome and was eaten as we floated along lashed together. We had coffee and albacore sandwiches with pickles and other sundries.

About one mile south of San Luis we came upon a slough in which a large flock of snow geese could be heard honking. Charlie and I stalked upon them through a sough of cold, waste-deep water. They took off with a noise that was indeed like thunder. Johnny estimated 1,200 of them. What a sight!

As we drifted down the river Johnny and I sighted four beavers. I was amazed at their size. They weighed easily 40-50 lbs. apiece.

The bank of the river collapsed into the stream continually in places when it was cut into by the full force of the river. The falling soil made sounds like the shots of a 12-gauge shot gun as it crashed into the swirling waters. Without doubt these falls of soil would swamp the unwary skiff that ventured too close to the cliff. As the strongest currents always veered us close to the cliffs it was a continuous job to scull away when they appeared.

We shot six coots and sailed along in the swift current. Finally we made camp at a point some 20 kilometers north of the railroad bridge. This remaining distance will be run in the morning. Our coot dinner was again delicious. The day's collections shed little light on our central question. Perhaps it is not a good time to think of you, Phyl, but nonetheless, I do, and in full force—

January 19, 1953

10 miles N. of El Mayor, Baja California, Mexico

We ate a breakfast of buckwheat cakes and ham and shoved off into the river. Johnny and I floated along looking for beavers on the bank. We could see many evidences of them—dozens of cottonwood and willow trees had been gnawed or felled by them. Their work seemed most often present when the bank was covered with rushes and small willows and cottonwoods were scattered among the brush. Many ducks and great blue herons were sighted as were a few small groups of snow geese and Canada geese. These latter birds were generally quite wary and flew with a great rush long before we approached them closely.

We stopped on the muddy bank alongside a still mud[?] filled backwater to make a collection. Al mixed a can of derris root and I spread it among the plants. Our collection was extremely small. It appears that the fauna is small. We waded around in the cold water among the reeds sweeping the bottom with no success.

As we floated down the river Johnny saw a goose that apparently could not fly. I quickly nosed the skiff over into the bank and Johnny jumped out with the 12 gauge. I set the anchor and ran after him across the mud flat. The goose was swimming into a broad backwater lagoon with his neck held low parallel to the water. I saw he would escape us unless he was headed off so I waded into the cold water (55 deg. F) and finally began swimming after him. I was successful in turning him back toward Johnny. Several Mexicans on the bank became excited and one rode off on horseback. I pursued the goose swimming and he got closer and closer to Johnny. Just then the Mexican returned with a gun. I swam on. My arms, which I had been exercising by rowing, showed signs of becoming cramped because of the cold water. Johnny shot the goose and I retrieved it before the Mexican could dispatch it with his gun. We proudly, and I shiveringly, presented it to Al and Charlie. Dinner!!

A short time later, as we rowed our way through an area of rapids and whirlpools we saw another wounded goose. This one swam into the swift stream with Al and Charlie after it, using their outboard against the current. After a long chase Charlie shot it with his .22 and hauled it aboard. Two geese for dinner!

As we cruised along the stream we passed many ranchos and at each the children rushed out to see the “pangos” floating down the river. We were apparently something of an oddity. We shouted greetings of various sorts and floated on.

Ahead of us we noted a group of people on the bank, one of which dove into the river and swam across. As we neared, this man, clad only in shorts, shouted for us to take him back. Johnny and I cut loose and rowed over. After a time he climbed aboard and we rowed him across. He was quite drunk. He thanked us and introduced himself as Manuel Tores. We gravely shook hands. We showed him the directions to his clothes and left.

I took the stern sweeps and rowed as we floated down stream. The other boat had floated out of sight and it was $\frac{3}{4}$ of an hour before we caught them.

Shortly after we had reunited a small plane was sighted overhead—it proved to be Giff Ewing in his Cessna. He circled us several times and dipped his tail. We released sea dye to show that all was well with us. I thought I could see Phyll in the cockpit and noted that the right side of the plane was always toward us as it circled. Then an object, like a paper carton, fell from the plane. I knew Phyll was aboard then. It fell in the reeds along the bank. Excited Mexican voices said “Nota, nota!!” We had no chance to retrieve it but I didn’t have to—whatever else might happen during the trip I was quite happy. I hope she comes back when we are in the lower river!!

We held up our geese for the occupants of the plane to see and then rowed on down the stream, passing under three ferry wires that hang low over the stream. It is very difficult to gauge the distance to those wires as you float up to them, as there is no plane of reference.

Finally we saw the railroad bridge and sighted Ben and Ted and the trucks. We nosed up onto the bank and loaded our gear into the trucks and trailers. We drove toward El Mayor and made a late camp in the desert. I had a little tiff with Al, because I thought he was being unnecessarily rude to Ben. I hope he recovers as I wish no hard feelings. The geese were cooked and were tough but edible. Tomorrow—off down the Hardy. I hope Phyl comes back with Giff. I want to know she is up there. What a time to be out exploring this way!

January 20, 1953

Just N. of La Panga Ferry, Rio Hardy, Baja California del Sur, Mexico

At dawn we stirred out of our various beds and began cooking breakfast. Al and the rest of us were once again on an even plane with no hard feelings. We loaded everything and drove off along the paved road that passes close along the eastern scarp of the Sierra Cocopah. These are rugged, rocky mountains and are extremely barren. There are said to be no sprigs in them. The Hardy is high and fields along its shore are flooded—shacks standing a foot deep in water. A big flock of American egrets was seen stalking along in one field and many ducks—baldpates, shovellers, teal, and others—flew as we drove by. The road swings between the base of the mountains and the westernmost bend of the Rio Hardy at El Mayor. Here we launched and loaded at 9:45 AM.

The stream is broad here and has practically no current. This spells a long siege of rowing for us as we must save our gasoline for the long journey in the Gulf to San Felipe. We will probably need to row 25 of the 50 miles to the Gulf. I took the sweeps first with Johnny in the bow. We all row standing up pushing against the oars. This is Portuguese style. It is much easier after one gets used to it. You can throw your weight into each thrust of the oars and blisters on hands and bottom are reduced in number or absent. We slid along through the brown water between mesquite and willow-lined banks. After a while we nosed into a fish camp and bought a round of cold beer—a welcome item after a row in the sun. We are all getting good suntans even though it is January. Days have been sunny and warm.

We tried to buy some beer to take along with us but off limits sales are illegal in Baja California just as they are in California.

We rowed along easily, enjoying the calm and warmth. I like to row and don't mind long periods of it if not required to make much speed.

The bank became lined with a dense growth of willow saplings four or five feet tall, and occasional patches of rushes. A stream cut in from the north and the current in our river increased noticeably. After we had rowed four miles or so other streams had cut in and the current was such that we saw that continuous rowing would not be necessary.

We heard the calls of many birds—coots, rails, great blue herons, and ducks—from within the rushes along the river's edge. There were also many calls none of us could identify. Trills, groans, honks, and screeches—it sounded all the world like the soundtrack from a jungle movie. Katherine Hepburn was nowhere to be seen. Neither were any of the birds. All this din and not a bird in sight.

A short distance downstream I noted a cormorant-like bird flying along. It was the first aubringa[?] or water turkey I had seen. A belted kingfisher flew low over the water. Behind us, over the rushes was the rugged Sierra Cocopah and Cerro Mayor, its highest peak.

As we slid along I could see through the scree of willow saplings into calm backwater ponds. These are exciting looking places of shaded water, big towering cottonwoods, and willows half in and half out of the water, and of beaver houses. I wanted to stop and investigate but we kept on.

We slipped past several ranchos whose buildings and equipment stood in muddy water. No one was to be seen.

Fish were collected from a little slough. We had our usual quota of times in the mud above the knees and the other joys of such work but we obtained a good series of fishes including the young of the mullet—an ocean fish and one which has colonized the Salton Sea. We are probably 25 miles above the highest brackish water.

Just below the collecting location I spotted a beaver house at the edge of the bank. We rowed over and inspected it. It was about 3-3 ½ feet high and composed of sticks no larger than one inch through and mud. The animal apparently spends some time sitting on top of his house judging from the dung collected there.

On down the river—plants became lower and open areas along the banks more prevalent. Finally, on the south bank a low growth of *Salicornia* (pickleweed) occupied the flat plain to the south as far as one could see. The gray peak of Punta Estrella at San Felipe can be seen in the far distance over this plain. It is our ultimate destination.

We stopped and anchored along a low vertical bank. The gear was passed ashore and we made camp. Driftwood was everywhere and I am sitting by a fire writing these notes after a supper of sauerkraut and weiners (with hot mustard), corn, coffee, and salad. We have just brewed up a pot of cocoa and can hear bats squeaking over us. There are a few mosquitoes for the first time which we hope will be dispersed by the breeze or numbed by the cold.

Well Phyl, we made about 25 miles good today and should place ourselves in a position tomorrow to make the run through the tidal area around Montagu and Gore Islands on the following day, as we had previously scheduled.

January 21, 1953

Between Panga Ferry and Montagu Island

As I retired to the sack I could hear the voice of a coyote upstream. He had a peculiar cracked voice as if he was having trouble barking. During the night I got up twice to check the anchor lines on the skiffs. The low banks could be heard crashing into the river all night long as the river cut into them.

At dawn we were up cooking breakfast and by 8:30 we were loaded and floating down the river. Shortly the water lane passed between tall barricades of willows and cottonwoods on both sides. There was much evidence of beavers but we saw none. Ducks were everywhere, flapping up and away from the streamside reed beds as we floated by.

I saw a little backwater and we landed to do a bit of collecting. Immediately as we stepped from the skiff we were over our knees in soft mud. In places there seemed to be no bottom and I do not doubt that one could sink out of sight. We searched around for a place to seine and finally tried in the main channel of the backwater. We obtained a vast load of soft mud and some young mullet. We left without further attempts in the morass.

We floated on. Al and Charlie nosed over between the roots of some big willows and soon we had floated out of sight of them. We anchored against a sandbar and waited. Across the river, in a big eddy, were a dozen or so coots swimmig in circles with the current picking bits of food from the foam that had congregated there. A Mexican rancho occupied the land back of the bank. We could hear the laughter of children and see pigs of assorted sizes running along the bank among the willows.

Finally, Al and Charlie showed up after having explored a backwater and we floated on. A flight of anhingas flew by. They are peculiar black attenuate birds that look like skinny cormorants. They flew with a crook in their necks.

A northwest wind began to come up. Before long, on the northward leg of the stream meanders the surface water became a confused mass of small wind waves. Here the current opposed the wind direction. We had to row continuously to maintain headway. On the south legs we fairly flew along.

We came together for lunch and just then Giff flew over in his plane. There were passengers but I could not identify anyone. I guess Phyl was sensibly at Scripps trying to get some work done. As they circled us we split up to pass under the wire at La Panga Ferry. This is, I believe, the nearest ferry to the Gulf. We hooked up again and started a pot of coffee but we came to a northward leg and had to row again. Finally in the lee of the bank we anchored and ate a peaceful lunch.

We made another collection, this time obtaining a fair group of fishes before becoming mired in the mud. The wind became constant and we rowed in shifts. The afternoon wore on and we decided that we should camp soon. The terrain had changed—the banks were getting higher and higher and signs were many that the water often rose 8-10 feet in the channel. There were no more rushes; the banks being covered with tamarix or mesquites. The ever-present coots were now absent and various sorts of sea birds had become common. We saw flights of graceful avocets, curlews, and groups of huge, white pelicans.

Finally we pulled off into a side channel and unloaded the skiffs up on top of a 8-10 ft. mud bank. We fought the skiffs up on top of the bank too. There was plenty of evidence that the water sometimes flooded to the top of the bank but the ripple marks and debris appear to have been deposited 3 or 4 days ago. We hope it will not come up this high tonight.

We cooked a carp (it was really delicious—the secret is that they must be skinned before they are cooked) and had hash, limas, coffee, and bread and jam. Al got plenty of exercise hunting for a lost fork.

We placed a marker stick in the mud and we can see that the water is rising quite rapidly. Now Phyl, off to my bed, which I wish will stay dry all night tonight.

January 22, 1953

Rio Hardy Estuary, Baja California, Mexico

After a rather fitful night's sleep I got up to sounds of breakfast cooking and a campfire burning. I arose, somewhat the worse for wear and went over to the fire and had breakfast—french toast and ham.

We seined in the little channel below our camp and caught pounds and pounds of little 1-inch mullet. I preserved about 1 quart of them and we released the rest.

We pushed our skiffs over the bank and launched them into the muddy river. It had risen about 4-5 ft. during the night, leaving us plenty of lee-way for a dry camp.

We rowed down the stream, taking turns at the oars. The current had become slowed as the stream broadened. It flowed sluggishly between low muddy banks. The wind was quite strong from the north and we had to row strongly at times to keep the skiff clear of the eroding banks.

The river banks were now perfectly flat except for occasional tidal channels and were of bare soggy mud except where salt grass clothed them near the stream border. We passed a tidal gauge set up and maintained by the Mexican division of the Boundary and Water Commission. It showed that stream waters sometimes reached at least 7-8 ft. above the present stream level. As we were hauling out on a sandbar we saw Giff Ewing overhead. We released some dye to indicate that all was well. He wiggled his tail to indicate receipt of the message and flew off. I am more grateful to him than I can express, not only for seeing that we are all right, but for easing the minds of those who might be concerned about us at home—you Phyll—I wish I were with you now—and Dot Allanson.

We made a collection which netted a few species including what may be a young goby and a young humpbacked sucker. If this latter is correct it is a rare find.

On down the river—we tied together to eat lunch. Many shore birds were in evidence. Avocets in considerable numbers, terns, curlews, and willets. The banks are becoming totally barren except for sporadic patches of salt grass (*Distichlis*). All else is mud or brown water and sky. At one place we found that by burying our legs in the mud we could lean over, either frontwards or backwards at outlandish angles. This occupied some time for photography.

The wind continued to rise and blew us along at a great rate on the southern leg and retarded us greatly as the river course swung northward.

The river became very broad—300-400 yards, and the channel very difficult to follow. Some trial and error was involved before we located it in several cases. Both Johnny and I had to hop out several times to push off sand bars and back into the obscure channel.

At one place we pulled up along side of a muddy bank and tried to sneak up on a group of feeding snow geese. We were unsuccessful as they flew off in a great rush of wings and honking. I did, however, find a fine collection of molluscs on the bank, some of which occur in the Salton Sea.

Finally, as we entered the estuary we hauled up along the bank and made camp within sight of the mouth of the river.

We attached long anchor lines on the boats, set a watch, and cooked dinner on the bank. Later we laid our bags out on the salt grass and Al and I wrote notes while the others slept.

The tidal effect is plainly evident here. Sally lightfoot crab burrows are everywhere. The flat back of us is covered with periwinkle shells and acres and acres of salt grass cover the highest ground. The banks bear the marks of repeated tidal incursion. We can see Montagu Island at the entrance. This is an historic spot though unmarked by bronze plaques. Francisco Ulloa investigated this very place in 1520, only about 30 years after Columbus originally discovered the new world. Ulloa was one of Cortez' men and sailed for him. He investigated the Gulf of California and showed that it ended in a river mouth.

A short time later this information was forgotten and California was considered an island—the island of “California”. This belief persisted until the late 1600s when Father Kino proved that the Gulf was blind.

Up this channel have passed steam boats to Yuma. Explorers have been turned back and upset by the wild tidal bore which coursed up the river prior to the

establishment of dams. At present the tidal effect seems limited to a large scale change in level—of the order of 23 feet at max.

We are busy at present pulling the skiffs up with the advancing tide.

Mosquitos are here but not in any great numbers—I hate to think what this place must be like in summer, with heat and clouds of mosquitos.

Well—I have been fighting to let this trip proceed as it will—slowly if necessary for safety's sake, but I can no longer hold my feelings. I have tried to convince myself but it is no use. My main object has been for days and is to get back, Phyl. This is an exciting trip and I will not forget it, but still I want nothing more than to be with you in stodgy old La Jolla and to see the surf and talk to you.

I know it is not good for any of us for me to become detached so I have fought this, but it is here and I will be honest. Wait Phyl. I'll be with you.

January 23, 1953

San Felipe, Baja California, Mexico

During the night I got up several times to look at the boats. The tide only came up a short way and then began receding. We pulled the skiffs up and set the anchors as we did. In the morning they were several feet above the water level. We seined along the bank and caught only a few mullet. The shell collection was better, containing several different species.

I cannot interpret our collections yet as I do not know nearly all of the species we have taken—particularly of the shells.

We shoved off into the broad muddy estuary and rowed for a time and then started the motors. The river is about 1 mile wide at the place and bordered by interminable mud banks. All vegetation excepting salt grass was left behind. This river mouth is a place of vastness, low relief and uniformity. One travels along with the motor pushing at 6 knots and nothing seems to change even though banks go by and new ones loom up before you. One can look backward and cannot determine the channel through which he has passed. It's a huge expanse of muddy brown water ending in vague distant desert mountains.

What had been a thin line of black on the horizon materialized into Montagu Island. We cruised up near to shore in an attempt to land and make a collection. The skiff grounded and Johnny jumped overboard to haul us onshore. He sank up nearly to his waist in the mud. Old John didn't let go of the rail of the skiff—he was afraid to for fear he would sink out of sight. This island is above sea level some 40 ft. in the highest places. Why it does not sink into the Gulf I do not know. It is a mound of nearly liquid mud. I even found myself wondering that the birds were able to walk on its shores without sinking. It was impossible to make a collection along its shores so we cruised on, passing among the gill net fishing boats. These boats are about 30-40 ft. long and fish the estuary for totuava, a large (120-140 lb.) white sea bass.

We left the island behind and started out into the Gulf, headed for a distant bluish triangle of land to the south. This is Punta Estrella, the point that marks the north entrance to San Felipe Bay. Several gannets flew from the water and off across the Gulf. We saw flocks of herring gulls and small white terns. Surf scoters flew ponderously from our bow as we cruised into their flocks. They seem to have a very hard time launching themselves into the air. The launching is accomplished by furious beating of the wings

and running along the surface of the water, breaking through wave crests, and finally, blessed flight.

The afternoon came and we had traversed over half the distance—65-70 miles in all.

Giff appeared high above us and flew low over us several times acknowledging our sea dye signal with a wiggle of his tail. Then he passed over us very low to the water, the door opened and a big package fell out and into the water a little way from us. It landed with a sodden bloop and disappeared. (It was later determined to be 6 cans of beer). Then another package was dropped—this time with a small parachute. We retrieved it and found a loaf of very special bread, a package of ice cold beer and the morning paper.

What a racket! Here we are cruising along over the calm gulf, our shirts off, enjoying the warm sun, drinking ice cold beer, eating avocado sandwiches, and reading the morning paper!

We cruised along, helped by a tailwind and the outgoing tide. I wanted to make it to San Felipe rather than camp on the shore as I was most anxious to get back. So I bided my time knowing that Punta Estrella at San Felipe would look close later in the afternoon, and that I could convince the others to go in then. This worked and we continued cruising through the beautiful sunset until well after dark. We ate a scanty dinner as we sailed—tossing sandwich materials from skiff to skiff. We even had a tossed salad—a head of cabbage thrown across the water.

As evening came so did a reverse in the tidal current. We had to buck this current and I suspect it cut our speed a good two knots. It was a long long time before we rounded Punta Estrella and cruised into the bay. Many fishing boats were at anchor and a few were moving around—all without lights of any sort.

We nudged up against the steep sand beach just below the parked trucks and were greeted by Ben and Ted on shore. It was quick work to unload and lift the skiff to the top of the berm—then we built a fire and drank a couple of bottles of Mexicali cerveza and discussed the various perils of our respective trips—of which there had been none in actuality.

Ben was a little full of tequila and poured his troubles out on me after the others had gone to bed. This commiserating cost me some yearned for sleep but Ben felt better, I think.

January 24, 1953

San Felipe Bay, Baja California, Mexico

Though there had been talk of hikes and seining for today, we went home instead. Al asked me if I would like to go home, and I told him there was nothing I wanted more. So he said he wanted to go home too and finally, without my suggesting it, the others decided to go too. This pleased me a great deal. The trip home was long and uneventful. I spent my time checking off the miles.

Phyl, I have never felt this way or missed anyone . . . [page missing!]

March 27, 1953

Entrance to Split Mountain Canyon, San Diego Co., California

At 3:00 PM Phyl and I left Scripps in a University jeep to explore Fish Creek in an attempt to see if fish populations still exist in the area. They are supposed to have lived there prior to a flood in 1916. It was a nice day, sunny and warm, and driving was pleasant.

We passed Julian, stopping for a cup of coffee and went down the desert slope. The hills were dotted with fragrant purple and blue lilacs. At Banner Ranch we bought gas and watched a big peacock strutting and displaying for a reticent female. We were interested to see the way he vibrated his tail feathers against the huge feathers of his train. This was done as he attempted to corner the female. It sounded like dropping a lot of fine pebbles on a screen door.

We drove on, turning off at Ocotillo and reaching the wash of Split Mountain Canyon just at dusk. I skirmished around and gathered up firewood and built a nice cheery blaze. We ate our dinner and enjoyed the moonlit night and the fire. George and Binky Harvey drove up just as we finished, ate their dinner, and we all went to bed.

March 28, 1953

Pushawalla Palms, Riverside County, California

We were up with the dawn and shortly had scrambled eggs and bacon ready. We then packed and drove up the canyon. The Harveys, in their little Singer, lead the way. When we had passed all the way through the canyon they stopped and hopped on the jeep. We drove on up Fish Creek wash, passing through miles of mud hills in the Carrizo Badlands. The wash is, for the most part, broad and sandy—easy jeep driving.

Finally at the junctions of two stream courses alongside a fairly large cliff of alluvium, we turned to the left and after 2 miles or so, came to the end of the road at the base of a high cliff, in the foothills of the Vallecitos Mts. We hiked up to the cliff. Ocotillos were in bloom giving a beautiful show of red at the ends of the long waving branches. Blue asters were everywhere—several *Oenotheras* (evening primrose), indigo bush, creosote bush, chuparosa, yellow California desert poppies, and others added their colors.

The creek lead up to the face of the sandstone cliffs which are about 200 ft. high, columnated by erosion. In one place water has worn a narrow fissure, generally not 3 feet wide into the cliff down at least 150 ft. from the top.

Seeing that there was no chance that standing or running water would be found here (we are looking for desert fish populations), we returned to the jeep and drove back to the junction, this time taking the right hand wash. This wash passes at almost right angles to the main Fish Creek Wash, ascending directly into the Vallecitos Mountains. [Drawing]

The wash is often composed of cobbles and is rough riding. In one place the road is forced to go over a boulder reef and it is a hard pull, even in a jeep. We made it easily, however. Once above this narrows the wash widens greatly and becomes very soft. We drove in four-wheel drive, low range most of the way. Many little purple flowers were scattered over the wash and the sand dune primrose (*Oenothera deltoides*) was common. It is a beautiful big white flower. As we climbed the slopes of the Vallecitos the vegetation became more brushy. *Yucca mohavensis* was common and junipers made an appearance. To our left, as we drove up the slope was the main peak of the Vallecitos, sparsely clothed with pinons and junipers.

I looked hard for signs of water in all of the rocky canyons but saw no evidence. The road passes up and over the main divide of the mountains on an alluvial apron that sweeps down from these peaks. Presumably this road comes out somewhere in the San Felipe Creek drainage system. We could look back and see across the entire Carrizo Badlands and out to Signal Mountains on the International Boundary.

It was a pretty day and I was pleased to see Phyl enjoy the ride completely. I had to drive the twenty miles or so back to Split Mountain Canyon quickly as we were pressed for time. In the way out of the side canyon George noted a bee hive far up a cliff. We stopped to look at it. The combs hung from a crevice in the rock in sheets. The rocks were coated with bees. Apparently the hive had settled on a seepage to build their combs, or so it appeared from 30 feet below.

We ate lunch in the shade of overhanging cliffs in the upstream end of Split Mountain Canyon. The shade was comfortable after our long ride in the sun. A wind came up before we had finished and swept down the canyon. Leaving the Harveys at the entrance we drove on down Hwy. 99. The wind blew unchecked across the flood plain that borders the Salton Sea. This seemed to deflect the car-speed wind behind the wind shield, giving us a very blowy time of it for the 40 miles along the sea.

Finally, after a very windy ride we arrived at our rendezvous with Francis and Nan Haxo, Johnny and Barby Haxo, and Colin Hough at the entrance to Pushawalla Canyon. They were waiting for us. We loaded Nan and the two small Haxos on board and drove up the wash. Wind and water had all but obliterated the road. Smoke trees arch over the road in the canyon just before the palms are reached. The old road that passed through the pond in the main oasis is now blocked with a dense tangle of bulrushes, fallen cottonwood trees, tamarisks, and other plants. A new trail winds among the streamside palms. I stopped the jeep amid these palms. It was a beautiful shaded spot in the center of this dense grove—a little sandy clearing with full skirted palms all around and a creek full of bulrushes on one side. Phyl and Nan were properly impressed with the beauty of this native oasis. After unloading I drove back down and returned with Francis and Colin, and their camping gear.

When we returned the wind was coming in gusts so we made camp above the palms where we could have a fire without danger of setting the skirts on fire. After some [?] we had a fine supper of hamburgers, potatoes and onions, salad, coffee and beer, and a desert of mock angel food cake. Nan cut cubes of bread out of an unsliced loaf, soaked them in Eagle Brand condensed milk and rolled them in coconut. We toasted these cubes over the coals and they were splendid.

Bufo punctatus did not call this night. At sunset *Hyla regilla* was in full chorus with air temperature 1 cm. above the water standing at 17 deg. C. A few toads were seen sitting in the creek, both males and females, but none called.

After the children retired to their tent we sat around the fire and sang songs and had a couple of rounds out of Colin's bottle. He said it "was just cheap American stuff but it would have to do." It did.

Phyl and I hiked off down the canyon in an effort to shake off its anesthetic effects. We proceeded fairly well and went to bed on a little shelf under the palms along the creekside. While we lay there looking up at the stars I called up a great horned owl and had the satisfaction of seeing his big black shape flap silently across the moonlit sky

(full moon) and settle on a palm frond almost directly overhead. I shone the flashlight in his eyes and they gleamed back at us.

We looked at the moonlight filtering down among the palms and drifted off to sleep.

November 3, 1954

Off Santa Barbara, Santa Barbara County, California

Mr. Smith stopped by the house at 6:30 AM and we drove off to Santa Barbara. There we drove out to the harbor and found Frank and Boots out rowing in the harbor. As there was no surf we loaded our gear from the beach and sculled out to the *Geronimo*.

Santa Barbara has a nice snug harbor but a sand spit is building up at the end of the jetty and threatens to clog the harbor as happened at Santa Monica.

The day was cool and perfectly calm. We steamed out westward in search of basking sharks. These huge beasts (to 40 ft. and 5-6 tons) are common during the warmer months just offshore where they sometimes cruise by in large schools. We are late in the season and expected our chances to be slight for seeing these brutes.

As we cruised eastward about a mile offshore we saw a large group of birds circling just off the kelp. Then we could see some black fins cutting the water. Before long we were in the middle of a screaming flock of gulls and 8 circling killer whales. It turned out that they were feeding on two dead basking sharks which had been killed the day before. The sharks had become caught in a purse seine laid by the Cecilia, a seiner. Vic Castagnola the skipper shot the beasts in the head with a 12-gauge shotgun loaded with 00 buckshot. The sharks were in about 60 ft. of water.

The old males were enormous. Their backs and fins came well over six feet out of the water when they surfaced. The blow of these animals is explosive. It is as if the air is forced out under high pressure against much resistance by the nasal sphincter. I could see the mauve saddle running across the back in front of the dorsal fin and the bold white markings of the body. The dorsal is so tall that it quivers back and forth as the animals rise above the surface. Frank estimated that the old males weighed over 6,000 lbs. There were two adult females, one of which swam up directly under our skiff (which was towed behind the boat about 8 ft.). She turned over and then came up and blew right alongside the skiff. She eyed the skiff and rolled on her side looking at it. What a magnificent creature she was! Her bold pattern of black and white is very striking.

One of the adult females swam directly under the stern about 6-8 ft. down with her mouth full of basking shark flesh. The ragged fragments streamed from both sides of her mouth. She rolled over and took a good look at our boat as she swam by. There was one immature male and two young animals weighing perhaps 400 lbs. We circled them several times disturbing the gulls from their feeding on big blobs of basking shark liver which had floated to the surface.

Off Summerland, Boots spotted the low profile of a basking shark dorsal fin. The animal was swimming along about 3 ft. below the surface with only the tip of its fin out [drawing]. This habit is called "finning" by the fishermen. It must have been very large. Frank said 20-25 ft. long.

Later we saw these huge fish jump clear of the water. This happened twice. Two or three tons of fish burst from the water nearly vertically and fell back the same way it

had come. Apparently this habit occurs only in the fall months first before the sharks disappear. It is thought that they hibernate on the bottom and lose their gill rakers. Perhaps this seasonal jumping is an aid to shedding the old rakers.

Back in port we ate a superb T-bone steak dinner whipped up by our redoubtable cook Mr. Brocato and then launched into a fiery poker game. After several hours I emerged with 75 cents in addition to my original hoard. Mr. Smith went to bed and I went ashore and drove home.

November 21, 1954

San Felipe Bay, Baja California, Mexico

After the usual loading exercises the trucks left for San Felipe. Mac drove the small one with Boots and Frank and I drove the big rig with Pat Patterson. Pat and I stopped for a few hours sleep at Alpine. We slept inside the live car. It was a fine hotel with screened windows and a roof. The only trouble—we parked alongside Hwy. 80 and big trucks kept rumbling by our ears at a distance of 4-5 ft.

No trouble at the border for a change. We arrived at San Felipe to find the others about to eat dinner. We met Julio Berdege and Mahadeva from UCLA. With Julio's help we learned that the boat we had chartered was still out to sea at the Islas San Luis. She was trying to get a load of totuava before coming in. A substitute boat was available but she needed to have her shaft realigned. This was supposed to be completed by nightfall. It wasn't, so we went to sleep.

November 22, 1954

San Felipe Bay, Baja California

Much inquiry today revealed that the *Felipe Angela* was being worked on—doubtless in the typical Mexican fashion—and should be done sometime in the afternoon. We fidgeted around and finally went to hear the UCLA-USC game on a wheezing-crackling old radio at Angia Riviera. The game was a joy to all as UCLA won 34-0.

We checked back with Manuel at the Cooperativa and found that repairs had been postponed until tomorrow and the boat would certainly be ready at 10:00 AM in the morning.

So we ate dinner and then Boots and Mac and I attended the local cinema and saw a boxing match in which a Mexican won the welterweight title and a remarkably miserable movie entitled "Tres Carinosas". It concerned the affairs of three fine looking young ladies in their attempts to catch three young men—all of whom looked exactly like Errol Flynn. The movie stopped three times and the sound once (a welcome relief). We sat in a cavernous hall which was mostly unfinished and the screen was made of plaster. The seats were of wooden slats and high enough so we could swing our feet—quite pleasant! The floor of course was dirt.

We walked back to our open air motel under a beautifully bright starry sky amid the yelps and whines of a dozen coyotes.

November 23, 1954

Roca Consaga Golfo de California, Mexico

We had all our gear ready to go at 8:00 AM and began waiting for the arrival of the Felipe Angela. 10:00 AM passed and she didn't appear. Boots and I drove to town and found she was loading fuel. Finally we loaded some gear in the skiff and cruised over to her. Her skipper, Fortunato Valencia, said since it was noon his crew was going to eat lunch. Boots and I unloaded the gear. I left him to pack it. I returned with another load and found everyone but Boots gone. He said they had gone ashore to eat!

Gad! Finally we had loaded all personnel and the live car over and hitched it up when they arrived. A little while later we cruised off at 6 knots for Consag Rock. The boat is quite clean for a Mexican boat though it has its share of cockroaches, but it is better than most.

There are no bunks and a little galley with a smoky butane stove (only one speed on the burner). The trip out was uneventful except that we learned that the cook, Simon, was a remarkable chap in that he often slept 24 hours at a stretch and had once gone 37 hours without waking. He is a gangling dark-skinned fellow with long black hair.

At the island we set the trammel net in 5-6 fathoms in the lee of Consag Rock. It was too late when we arrived for us to scout the ground properly and we caught nothing. The water was filled with phosphorus which makes the net light up like a big luminous screen, thus reducing our chances of catching anything.

Mac, Pat, and I slept on the stern and watched the sea lions rocket under us in the lumious water leaving brilliant cold greenish blue trails.

November 24, 1954

Eroute San Luis Gonzaga Bay

We got up and set the trammel net before dawn at the place where we had previously seen the grouper and other colorful fish. We caught 5 seals and no more. Obviously the fish which are here either have moved out because of tide or water temperature.

We loaded the net and then went ashore on the gravel and cobble bar. I wanted to see if there were tide pools. Even though the tide was nearly high I am sure there are none on the bar. There were plenty of sea lions. I counted 400 of which about 2/3 were pups. The air was full of flapping pelicans and blue-footed boobies and the yelps and howls of displaced sea lions. I climbed one rock occupied by a young blue-footed booby. He moved over but not off. We walked around and around. Finally, I cornered him and he flapped and tried to hang on but finally flew off. I was within touching distance for the whole time.

There was no use staying so we started for San Felipe after bailing the live car dry.

On the way back I tried to plan and decided the only solution was to send Mac and Pat back in the Stake truck and for the three of us to leave as soon as possible for the region around the San Luis Islands. We found that terms would have to be discussed at the Cooperativa in San Felipe. I doubted that we could meet the price as nearly all the boats were fishing in the south and making up to \$700 per day on totuava. However we finally arranged for \$70.00 per day. I was agreeably surprised as our crew is good and the boat is in fairly decent shape. I think the credit must go to Frank and Boots who have impressed these fishermen that we are not turistas but are workers like themselves.

So we unloaded some gear to send up to Marineland and off went Pat and Mac. We three went back to the boat, cooked our dinner and waited for our crew, who promised to come by 9:00 PM. They had to load ice and the loading chute could be reached only at high tide. Finally, at 9:30 they came aboard and we backed under the chute and put 2 tons of crushed ice in the hold. After a while I laid out my bag and air mattress in the bottom of the skiff and went off to sleep. Frank is sleeping all curled up in the pilot house and Boots sleeps in the galley. The crew bunks down in the foreward hold. There are no bunks, just padding and blankets piled over the ribs of the ship. What with cockroaches and a closed hatch it must be jolly. I guess it is all what you get used to.

November 25, 1954

San Luis Gonzaga Bay

When I woke up this morning we were quite far out in the gulf. Apparently we had gone out to sea to avoid any shoal water in the night. I could see the San Luis Islands (Encantadas Islas) in the distance and farther still I could see bits and fragments of another island, lifted and distorted by the air's refraction. It was Angel de la Guarda Island some 75 mles away.

The sea was a flat glassy calm as we cruised southward and not a trace of a cloud in the sky. The air was warm but not hot—thoroughly wonderful.

Boots shouted—"Look, could that be a shark?" I had Fortunato circle and we came upon a wonderful sight—a peze sapo or toadfish to the Mexicans—but a whale shark to me and the largest fish that swims the seas. This one was only a baby at about 12 feet. He looked like a huge overgrown tadpole and he had a broad blunt head and a body which tapered back to a slim tail. The first dorsal fin is set remarkably far back on the body. The beast was a reticulated white network over a gray blur background. We saw a school of small bait which the beast was following. Also amongst the bait was a beautiful jack—greenish-gold with bold vertical black bars. We left the shark lolling at the surface and cruised on toward El Muerto Island, 5 miles to the south. This is the first of the Encantado group [drawing].

Our cocinero (cook) brought out an amazing meal of burro stew, spanish rice, french fries, and salad. It was really delicious.

As we passed El Muerto Island (so named because its volcanic cone is supposed to resemble a dead man with his hands pressed together in death). Fortunato decided to try for some bait. We cruised along the north shore of the island and dropped some ¼ stick charges of dynamite into bait schools. The bait was too small so we abandoned the effort and headed south. In this one spot we passed over 50 or more tons of bait so tightly packed that the water appeared black. I don't see how there is sufficient oxygen in the center of such a school for the fish to survive. The center fish would probably asphyxiate if the school became static.

Frank and Boots repaired our trammel net as we cruised along. They are wonderfully skilled craftsmen. I watched in awe as they sorted out the broken places, cut the net, and reworked it. My awe is increased by the fact that I tried this a while myself and spent three days doing badly what they did superbly in 20 minutes.

Later we passed San Luis Island (Encantada). It is probably wholly volcanic. It lies offshore about five miles—one end is composed of flows and the other a perfect cinder caldera.

Frank caught a bonito on a bone jig. The bonito has little finlets on its tail which I think serve as vortex generators to sweep passing water down into what would otherwise be a drag—producing a vacuum area [drawing]. What a wonderfully streamlined creature. Its eyes are faced perfectly into its body. Its dorsal fin fits into a groove and its pectoral fins occupy a recess during fast movement.

Lupe, an old man on the crew told me about the antelope which come down along the shore in the heat of the summer. Inshore from San Luis Islands he says he has seen them wade into the sea up to their necks and stand there to escape the heat.

Chicho and I had quite a conversation. He is a little brown smiley man in his forties. He had been in San Felipe years before the road came through and had made his living fishing from canoes with a hand line. It often took 24 hours to get to Mexicali in a truck as they almost always had trouble on the tidal flats at the mouth of the Laguna Salada. For eight years he had had what were apparently stomach ulcers and he almost died a couple of times. He still has trouble but eats his peppers with the rest.

The skipper is Fortunato Valencia—a grizzled man of about 55 years. He is probably mostly of indian extraction as his skin is dark and his nose flat. He is a very astute man and from what we can see, widely respected in the local fleet. He moves like a seaman—watching clouds and tides and is reported to be about the most successful fisherman in San Felipe. Many of his observations have paralleled Frank's for our coast. His rule is by respect. He has never issued an order as far as I could see. He is friendly and answers all our questions with a smile befringed with white whiskers.

We passed the islands offshore of us and finally rounded a point of land and entered San Luis Gonzaga Bay. It is completely land-locked and one of the most beautiful places I have ever been. The mountains surrounding the bay are rugged volcanic peaks and mesas all virtually devoid of vegetation. Along the inshore limb is a crescentic white sand beach with a long winding lagoon behind. The bay is divided into two parts connected only at high tide. [Drawing]

There is perfect shelter from all winds. The south section of the bay is called San Francisquito Bay—the north San Luis Gonzaga as nearly as I could tell.

It was nearly dark when Frank and Boots and I set the trammel net. Once again we hadn't had the chance of scouting our grounds before using this net. We didn't catch much—three bonnet head sharks (all of which died) and a porgy.

Back on board we set out for night fishing and found a good spot on the outside of the bay along a rocky cliff. We had good luck and came back with some small groupers and a nice group of pargo muleta[?]*—a pretty banded snapper. They are red, bronze, black, and white. After dumping our fish in the “vividero” (what the Mexicans call our live car) we went to bed. I slept on the stern. It was clear, calm, and moonless. Where the 2 in. waves lapped on the beach a line of phosphorescent fire flickered.*

November 24, 1954

San Luis Gonzaga Bay

Before dawn the three of us were up and off in the skiff to make a beach seine haul. We had heard of a lagoon entrance and cruised over to where it was supposed to be. There we made a set but the tide was out and so were the fish. We caught a flock of diamond stingrays, botete, and one little jack. Off we went, knowing more sets were useless at this tide. Back on board we hauled up the anchor and headed out of the bay

and up north about a mile when we entered a broad mouthed bay which proved to be the northern half of San Luis Gonzaga.

The crew took our panga and rowed over into the estero we had been looking for. There they got mullet by throwing dynamite into the fast-swimming schools. Meanwhile Boots and I caught a few bonefish and little *Prionodes*.

Off we went with our carada (bait). Just at the south edge of the entrance we stopped under a big basaltic cliff and began fishing. The fish went wild over whole mullet. It wasn't many minutes before we had 3 or 4 big pinto cabrillos. I took off my clothes and got in the live car to wield my hypodermic needle to deflate them. Then they really started to come including big garupas (groupers) and more pintos. In 30 minutes we had 20 in the car and I was going crazy trying to care for them all. I was all covered in slime and regularly getting poked in the rear by the spines of passing fish. I called a halt as I thought the live car was at about capacity. The other fish went on dock for the crew to sell. Frank and I looked ruefully at each new addition but I remained firm against his "just one more". Finally all were deflated and swimming well. Some were 4 ½ in. long.

We left the grounds when we were out of bait and cruised back to the bay. I wrote in my journal while the others went off after more mullets.

At dusk we went out to try for some small reef fish with the gill net. It was very discouraging as they all went to bed under rocks and we caught only three passing porgies. I had developed a rather nasty cold and after a little more hook and line fishing I cancelled a proposed midnight seining trip in the lagoon and we all went to bed.

November 25, 1954

Enroute to San Felipe

Today is Thanksgiving. Frank suggested that we cook a pelican but I say that the groupers are enough for us to be thankful for. We agree. All are doing well this morning except one small one which died. We were off at dawn with the volcanic hills and the occasional cardon cactus standing as jet black silhouettes against the orange sky. Back on the grouper grounds we caught a few more for the crew and then left for the islands to try for totuava. I had saved space for a couple if we should catch them.

I wanted to try obtaining some reef fishes with poison (rotenone) and so Boots and Chicho and I loaded the skiff as we cruised along and took off with the outboard for Isla San Luis Gonzaga 2 miles distant.

The island is wholly volcanic. A long spit of sand stretches out on the inshore side. Great cliffs of carved volcanic ash and pumice form the south end, a big cinder cone stands in the middle and a smaller cone and massive flows of rhyolite lava and obsidian form the north end. It is forbidding and beautiful. We came upon many long stringers of black volcanic rock stretching out into the ocean at the shore. I tried poisoning and caught a few sergeant majors and opal eyes but all died from the poison even though they were all given clean water at once. We saw two golden groupers—bright orange over all. We had no success in catching them.

Boots and I walked up on the island among big *Salicornia* bushes and numerous gulls nests to the nearest cinder cone. Back on the skiff with some samples of pumice to show Frank. We started out for the boat but Chicho told us of a lagoon nearby so we went for it. He led us to the north end of the island to a place where little fjords [?] in to

the lava cliff . We followed on such into the cliffs. On either side of us jagged cliffs of red, black, and brown lava seamed with volcanic glass rose up 40 feet or so, while the water under our keel was 30-40 ft. deep. At the end of the fjord Chicho hopped ashore and waved for us to follow. We did, scrambling up the rocks and at the top we saw a completely landlocked basin of sea water about 100 yards long lying at the base of the lava mountain and completely surrounded by floes. In one place tidal water was pouring in from the sea in a small brook. The level was about 1 ft. lower than the sea outside. Green caliciferous algae had built stalagmites up from the bottom, giving the pool a weird hot spring-like look. I saw a fair number of fish including opal eyes, sargeant majors, and one grouper. Chicho said a skiff could enter at high tide and that turtle were sometimes trapped in the lagoon.

Outside again we made a dash for the boat and caught them at Isla Choyula where they were unsuccessfully trying for totuava.

At Isla Muerto we fished in the midst of a flock of diving pelicans. They close their wings the instant before entering the water and enter with bill closed. Young Heermann's gulls were picking up fish that escaped as the pelicans squeezed the water out of their pouches prior to swallowing their catch.

Every diving pelican had his attendant gull screaming in his ear.

We are now heading for home on a flat calm sea with the vividero towing along behind. The barometer is dropping and there are clouds to the north. With the new moon here we expect to make port tomorrow morning, just before it begins to blow.

March 1955	Baja California
April/May 1955	Baja California
May 1955	Santa Catalina Island
May 1955	Pushawalla Oasis/Lone Barchan
July 1955	Santa Catalina Island
August 1955	Santa Catalina Island
April 1956	Guaymas, Mexico
September 1956	Seal Trip
January 1957	<i>Tursiops</i> Trip
February 1957	Pilot Whale Capture
January 1958	San Felipe <i>Tursiops</i> Trip

March 10, 1955

Four miles N. of El Mayor, Baja California, Mexico

Frank and Boots and I are on our way to San Felipe to attempt to capture some totuava (Mexican white sea bass) for the tanks. We will be relying on the nets of Boyd Walker of UCLA. He is trying to catch fish to stock the Salton Sea, and is particularly interested in yellow-mouthed corvina. This is a big and plentiful game species at San Felipe.

On our truck we are carrying a splendid new transport tank which has just been built by Frank and Boots after two weeks of loving labor. They really slaved over it and we have great hopes for it. The trip down the coast route was uneventful. When we reached the mountains on Highway 80 we began to realize that we were carrying a load on the truck (10,000 lbs. of sea water). We had dinner in a little Hungarian place. The old lady serving us had muscles like a shot-putter and the expression of a surly bulldog. Her husband was a meek little quiet guy. He was a good cook but I don't envy him his job.

Once on the In-Ko-Pah grade road and going downhill, we really began to feel the load. I drove slowly and used the brakes sparingly, but even so the brakes began to get slick, and finally I geared it down to low gear and we crept along with the motor roaring. At the bottom we stopped for gas and I could scarcely bring the truck to a stop with the brakes. The brakes are definitely too small for the load we are carrying. Also, after this we will take Hwy. 99 home. There are fewer grades. We got coffee in Calexico and crossed the border, well after dark. As we pulled up to the border gate, a U.S. official rushed out and hollered, "Hey, don't you know you can't go across the border without paying duty on that furniture?" He pointed to Frank and Boots's tank. There could be no greater flattery than this. Both of them swelled up visibly. Obviously we had a Louis XIV fish tank on the back, created by certain San Pedro artists.

The Mexicans came out too. Finally one official went into a nearby restaurant to get the big boss to decide what to do with us. I had papers but have learned to sit still and be quiet and usually, after much jabbering, you go on your way. The big boss came out, munching his dinner, looked at our rig and said in a most insolent and patronizing manner to his assistant: "You dope, don't you kow these people were through this mornig and got

permits and visas?" The crestfallen fellow waved us through as the boss stalked back to his interrupted meal. We rode joyously through on Boyd Walker's coat-tails.

Before long we got sleepy and I pulled off the road. Frank, as usual, slept in the cab. He is leery of sidewinders and other critters of the desert floor. I perched on the edge of the new tank and worried about falling off all night. Boots slept in the back.

March 11, 1955

Fish Springs, Imperial County, California

We pulled in at San Felipe about noon and had breakfast at Herman's. The we hunted up Boyd and crew and found them gathered around a *Tamarix* tree, out alongside the airport. They had a nice camp. As near as I could tell there were about 12 fellows, all eating voraciously. Old Mac was there feeding his face. He had just finished cutting the skull off a big male bottlenosed dolphin lying on the beach. I looked at the remains and the animal is much darker than the Atlantic species. The dorsal surfaces are almost black and are patternless except for some faint markings. After we helped in the feeding frenzy we all went out and set the big net. When I say "big" this is no exaggeration. It is over 600 ft. long and of 1 in. mesh. Two portable gas winches are used to haul the ends of the net onto the beach. From there it is done by the slaves. It is hard, back-breaking work, even with 16 of us. The first haul netted us little except 12 corvina and a lot of anchovies. Boyd mentioned that he would like to plant the Salton Sea with anchovies. I was anxious to test run our tank and volunteered to take a load up for him if we got anchovies on the next hauls. On the very next haul (each haul takes 2-3 hours), we hooked the corner of a school of these anchovies and Boyd gave the word that we should load up. We did, and Dick Whitney (a biologist on the Salton Sea project) and I and general handyman named Clarence hopped in the truck and left, after getting papers from Sr. Patino, the local fish lord. It was 1:00 AM when we arrived at Fish Springs on the Salton Sea and planted our load. The tank had done well but we were overloaded and lost a fair quantity of fish. Finally at about 3:00 AM I sacked out on the lab floor.

At 6:00 AM we were up and away. The trip back was uneventful and we arrived at San Felipe about 12:30. That afternoon we loaded the Fish and Game truck with more anchovies and they left. As a crew, they don't work too hard. One in particular, colloquially called "Jello Gut" sat very still all day and griped about conditions in general. He had an immense paunch and won Boots's and Frank's immediate dislike.

Briefly, we went to sleep in the evening and got up at 1:00 AM to catch the incoming tide. We set the net out 1,200 ft. by tying lines together. When it was hauled in we had some immense diamond sting rays and a lot of *Rhinoptera* rays. Before we loaded the rays, we drained out the truck of all its dirty water and filled it up again with the Fish and Game portable gas driven pump. This is a wonderful gadget as one can fill up anywhere and can go to the site of collecting with an empty truck. We loaded the truck and Frank and Boots and I rumbled off down the road at 4:00 AM towards home. 80 miles south of the border, just at dawn, the northern sky lit up in a flash. It was a miniature atomic bomb being set off in Nevada over 300 miles away. We each ruminated with our own thoughts for a long time. It made a reality out of the atomic age and a frightening one at that.

We ate a welcome breakfast in Westmoreland and then drove for home, reaching Marineland at 5:00 PM, cramped and tired, but with our charges still alive.

March 20, 1955

Truckhaven Trail, San Diego County, California

Bob, Phylly, and I left for a sand dune trip. We met at Van Nuys and drove down through the Coachella Valley in a fine windstorm. The sand was whipping down the valley floor. As we passed Travertine Point we acquired some lee.

I wanted to look for some Indian fish traps which are supposed to be on the alluvial fan below the old Lake Cahuilla shoreline. We were told that these traps were about a mile up the slope from a quarry just south of Salton Station.

We hiked through the quarry and up the bajada for a way. I climbed onto an old shoreline beach but failed to find the traps. They are supposed to be V-shaped and open at the apex. The V's are supposed to be open widest on the upslope side. We saw no signs of them. I found a few pot shards and we picked up firewood and drove off up the Truckhaven Trail to camp. It was dusk when we came to our wash filled with smoke trees. The car got well stuck as we tried to drive up above the wash bank. Leaving it in situ we set up camp, built a nice smoke tree fire, and ate a vast dinner of steak, fried potatoes, salad, peas, tea, and peaches. Phylly really stowed it away, much to Bob's and my delight. A nice lot of speculation about sand dune origins around the campfire and then bed. It was brisk. Phyll's feet were cold.

March 21, 1955

Bajada above the Algodones Dunes, Imperial County, California

We had a thorough-going morning constitutional getting the car out. We had to turn the car around by jacking it up and pushing it off the jack. We built an excellent cobblestone road and made it out in one splendid effort. All preparations had taken a couple of hours.

We were off. On Highway 99 we looked westward up the old lake bed slope and could see a beautiful barchan dune (u-shaped), pinkish in the morning sun. We found a good road which took us within a mile of this lone dune. It was about 45 feet high and rested on the old dissected lake bed just below the old shoreline. We hiked over, passing over a couple of vertical walled arroyos. The soil was covered with ventifacts in all sizes and shapes. The wind, with sand-grains as its cutting edge, had polished many stones to a dull sheen and had eroded others into little pinnacles, arches, and such.

Where we had parked the car the soil was a mass of self[?]-rising ground tufted with saltgrass—*Distichlis*. Apparently there is a seepage. Bob tested the salt, made a wry face, and pronounced it mostly epsom. I found a perfect little Indian bird arrowpoint of red stone.

The weather was cool and sunny—perfect for hiking, but by the time we reached the dune we were all a little tired. Phylly and I sat down in the shade of the dune. I dug out a scorpion burrow for her. It was low-arched in cross-section and extended into the dune about 1½ ft. The scorpion came out with tail raised and pincers “en-guard”. Phyl was most interested in the grotesque critter.

The dune rests alone on a surface of desert pavement. The nearest sand deposits are perhaps 1½ miles away. It is composed of fine uniform peach-colored sand. From above it looks roughly like this [drawing]. One cusp rests in an arroyo (tule arroyo)

about 10 ft. deep. The other cusp is much longer, extending out over a flat surface. We could see hardened layers on the side of the dune, which much represent old surfaces. They lay at lesser angles than the present surface.

On top of the dune a secondary crest had built up—probably due to a period of reverse direction winds. I wonder if there are seasonal differences in wind direction, with the “effective” wind at one season only. [Drawing]

The cusps indicate the effective wind direction is about WNW, and blowing directly toward other barchans far down the slope at Salton Beach. The dune sand contained some fragments of sea shell material from the old lake bed.

We staked the dune—running stakes along the lee slope and two out in the middle of the arc. We should be able to detect movements by checking these stakes.

I have a notion, that though these barchanes are considered “moving dunes”, they do not move after they reach a certain size but merely shed sand off their cusps and over their drop slopes while the main mass remains stationary. We’ll see.

In Tule Arroyo I noted some roots of a mesquite bush which had been exposed by the stream cutting into the bank on which the plant was growing. These roots extended 65 feet before disappearing into the riverbed again.

We hiked back to the car, arriving about noon. After a stop at Westmoreland for milk (where the Chinese groceryman bowed and scraped to my “professor” brother) we drove up to Superstition Mountain. Bob photographed the dunes while I dug up some desert lily bulbs for Phyl. The flowers were beautiful. Many of these white lilies were in bloom and sand verbena and giant sand primrose were all around. A splendid lunch was eaten alongside the old ruins of a quarry keeper’s house.

Bob found a dead sand lizard (*Uma*) and so did Phyl. Perhaps this is a mortality connected with spring emergence.

April 27, 1955

San Felipe, Baja California del Norte, Mexico

3:00 AM. After a couple of hours of broken rest I got up and drove up to Jim Long’s place and loaded his gear. We drove off to Marineland where we started off in the big truck and were on our way to San Felipe. As we passed Frank Brocato’s house we waved to him and Boots. They were waiting for us with the pick-up truck and the skiffs. The drive to La Jolla was uneventful except that I had a fine conversation with Jim. It is a wonderful way to get to know your staff well to take them on trips such as this. Jim is an interesting and humorous soul and should be a fine trip companion.

At La Jolla we stopped in front of Jon Gnagy’s apartment. He is an artist and writer who plans to do a feature story on our collecting operations. We all piled out and had breakfast as his guests. Mary Jo Gnagy had prepared a real feast—scrambled eggs, coffee, bacon, cinnamon rolls, and fried potatoes.

This trip is being taken expressly to catch specimens of the giant Gulf sea bass, the totuava. They reach lengths of 6 ½ ft. and weights of over 200 lbs. They migrate up the Gulf this time of year and spawn in the mouth of the Colorado River. Reports have it that numbers are being taken at San Felipe. We have reason to think they are tough and will stand the battering of transport. This is in contrast to our own smaller white sea bass, which is too touchy to live through any rough treatment.

At the border we were stopped by Mexicans and, as usual, we didn't know what to expect. This time we were lucky and were waved on after a brief period of knowing head-nodding at our papers.

A little way down the road we stopped for tacos and beer—enjoyed by all. Jim, who is a musician, had his delicate sensibilities assaulted by the Mexican juke box, which was turned on full blast. I think he is approaching this in the wrong manner. While I agree that some of it is hardly music, it is part of the Mexican scene and I thoroughly enjoy it—particularly at full volume.

At San Felipe we found everything essentially the same as when we had left two months ago. There were swarms of tourists, but the St. Francis de San Felipe was empty. This is our vacant concrete building that we use as a camping spot. Tomas Guerrero, the owner, spent so much money building the walls that he has never put a roof on it, so there it sits, open to the stars, and a perfect camp spot out of the sand and wind. The doors were barred with Ocotillo poles, but we rented it from Tomas for one dollar a day. We can pile all our gear into it and leave it during the day. It is wonderful at night to watch the moon, stars, and clouds move by. It is built on the edge of the beach and adjacent to the skiff launching slip so it is perfect for us.

Boots cooked up some macarone with olive oil and onions. Jon had gone surf fishing so I walked off down the beach to call him to dinner. Hiking was pleasant along the sand at dusk. The sea was flat and gleaming and the air was warm. Mullett jumped all along the water's edge. I didn't find Jon but found that he had gone back another way. Aafter dinner we gassed for a while about this and that and then went to bed. Skies were clear and there is no wind.

April 28, 1955

San Felipe, Baja California del Norte, Mexico

We were up at 5:00 AM. We loaded for the day's fishing. The skiffs were hauled down and launched. Then we put the bulky live car in the water. The newest motor would only run on one cylinder. It was shorting out someplace. Finally, after much tinkering we left for the northeast of San Felipe. There we fished for bait. The procedure is to catch bait on hook and line and then put them on very large hooks which are dropped to the bottom. The bait consists of 1-2 lb. croakers. This croaker is *Micropogon ectenes* and is called chano by the Mexicans. Apparently it occurs out in the "channel" but is not often taken close to shore. The croakers bit avidly early until the slack high tide, but as soon as the tide switched they stopped and we began to catch sting rays (*Urotrygon* sp.) and guitarra (*Rhinobatos* sp.). I spent some time tinkering with the motor. Finally, I found that one of the plugs was cracked completely in two. With a little tape and string I put it together and the motor worked for a while until it jiggled loose again.

We had hired an old Mexican friend as a guide. His nickname is Chicho. He is a gentle old white-whiskered soul who was sporting a badly arthritic hand and wrist. I don't see how he could work but he did. Doubtless he didn't have enough money for medical aid. His real name we found was Narciso. He has never mastered my name and calls me "Kelly"—pronounced "kay-lee".

Just after settling down Boots let out a yell. He shortly hauled in a beautiful totuava well over 5 ft. long. We quickly sunk the live car while Jon maneuvered for pictures. We slid the big fish through the side door of the live car and I jumped in and

deflated him with the hypodermic needle. The Mexicans call the needle an ajuga. The fish had come up from 48 ft. and she was badly inflated. After the gas was released she swam around the tank very nicely. No more fish came in. We did not attempt to tow the live car in but anchored it with a 60-lb. anchor and a long anchor line.

On our way back we spotted porpoises, which I think are an undescribed species. They were very small, probably under 5 ft. They were dark brown with a small, rather triangular dorsal fin. Jim saw one quite close aboard and reports that it was blunt-snouted like a Dall's porpoise. The two I saw were wary of the boat and sounded when we came within 100 yards. I suspect they are the harbor porpoise, *Phocoena*, but of an unknown species. They could be heard to exhale and inhale as they swam along.

Several times we ran across schools of Gulf rays (*Rhinoptera steindachneri*) swimming close to the surface. Some of them had their fin tips out of water. They fled immediately when our skiffs cut through their schools. Sometimes they were so numerous as to appear as large brownish patches on the water some distance away.

Back on shore I took Jon around to make arrangements for him to take the bus back to Mexicali. He was bent on culture so we stopped by the local cantina, which has something of an evil reputation. Things were progressing nicely when we arrived. One well-lubricated fellow was doing a sort of solo hat dance to the thunderous music of the juke box. Jon broke out his sketch pad and furtively drew a series of quick impressions of the place and at the same time tried his first tequila and lemon and salt. This, I feel, is really too much culture at once. These potent things should come one at a time. We turned in after getting all our gear ready for the morning.

April 29, 1955

When we arose at 4:30 AM the sun was barely lighting the eastern sky. The tide was very low, exposing wide tidal flats in front of the St. Francis. We had planned to make a set with the beach seine in order to obtain bait quickly, but we could see it was useless under the circumstances so we reverted to the Mexican system and shoved off to fish for bait. The motor had a new plug in it but somehow the cover was shorting the cylinder out so, after some tinkering and much cursing, mostly in Italian, we left without the cover on the motor. As we passed the point we ran into a very large southern swell, apparently from a storm down toward Guaymas. I quickly fell into the clutches of mal de mar.

At the live car, which we found easily using a series of landmarks on shore, we found that someone had tried to gaff our totuava. The gaff was floating in the tank and the fish was swimming nicely around the bottom of the tank. The top had been latched. Frank theorized that the *& had tried to gaff the fish and had hooked him. The fish then jerked the gaff from his hands, later shaking it loose. There must be some good in the toad's soul as he hooked the top and thus prevented it from being washed away by the waves.

We fished and caught a fair number of croakers, but no totuava. The wind began to pick up so Frank and I decided it would be best to begin towing the live car with one boat while the other drifted and fished. We did this. The live car was so heavy that, even after 6 hours of towing we had made about 6 miles of progress. By this time the wind had risen and all boats were making for the harbor. Frank hooked his skiff on ours and we tried using both boats to tow. It speeded things up nicely but constantly brought

water over our bow and gunnels. The blow kept building up so I called a halt and we dropped anchor and started in without the live car. It was thoroughly sloppy going and the coverless motor kept cutting out in the spray. We were still a good two miles off the point when Frank took us in tow and we started in behind him. Long before we reached the point Boots and I were soaked to the skin. Old Jim sat dry and happy in the big skiff laughing his little sardonic heart out at the sight of us. Before long we beached everything and hauled all the gear up to the St. Francis. It feels wonderful to get some honest exercise after answering the phone and writing letters.

Frank and I set out to make arrangements to charter one of the big boats to haul our live car. It is obviously impractical to do it with our skiffs. There are about 5 tons of water inside it. We found the skippers reclining inside an old broken skiff on the beach. We agreed on 30 dollars a day for the boat and crew, which is well worth it to us, seeing as how the wind is still increasing. We are to meet them at the point at 4:30 AM in the morning.

Back at the hotel we had a glorious chapine of totuava meat and various vegetables, potatoes, onions etc. The fish was donated to us by a sportfisherman who is camped nearby. Off to the sack.

April 30, 1955

We were out of the sack at 3:30 AM and loaded by 4:00 AM. After a quick cup of coffee we cruised out into the bay. The swell had switched to the northeast and was as bad as the day before. Before dawn we were at the point and waiting for our boat. It didn't appear so we scouted around the point, getting well sprayed in the process. No boat. We ran from boat to boat but she didn't appear until nearly 7:00 AM and then she had a party of American sportfishermen on board. We were thoroughly disgusted but boarded and found that the boat hired by the fishermen had broken down (a logical thing) and they had bee shifted to our boat. So, we calmed down and went after the live car. Our landmarks took us right to it. Frank and Boots secured it to the stern and we were off. But the choppy sea and the long cable combined to allow the live car to dive. We looked back and it was gone. All we had was a taut cable. I yelled "alto" to Luis, the captain. After we stopped, the old car slowly came to the surface. Frank shortened the cable and off we went. I was mightly glad we had latched the top as we would have lost the fish otherwise.

After catching our bait we sat fishing for a long time, then suddenly my line gave a mighty yank and I dropped it. Luis picked it up and shortly we had a beautiful totuava on the suface. Two others had hooked up at the same time. Frank and I and Boots quickly took our two fish back to the live car. I took off my clothes and jumped in while they struggled with the fish. Acrobatics were required to get the monsters into the car in the heaving sea but in they came and I deflated them as the waves washed over me and the live car. I pulled myself out and dressed. Before long we ran out of bait and couldn't catch any more, so Frank and Boots and a couple of crewmembers went inshore in the skiff to fish for some. After about an hour they returned with a tub full of bait. In the meantime another totuava had been caught. She was hooked by the pectoral fin and gave the fisherman a terrible struggle. It hurt my soul to see the fish gaffed and swatted with a long club.

We distributed the bait around and before long one of the fishermen had a strike and fought a 6-foot totuava to the surface. He told us we could have the beautiful beast so off came my clothes and back into the live car again. It was a wonderful gesture from the fishermen, all of whom turned out to be fine fellows. The three new additions all swam nicely around the live car.

In the afternoon we hauled up our lines and made for harbor. It was a pleasure to watch the live car bucking along behind us at considerably more than one knot. Offshore, in front of the St. Francis, we anchored the live car and went ashore. It was far too rough to think about landing the beasts and the tide was low. We knew we would have to wait out time that evening about 9:00 PM.

After dinner we sat watching the rough surf and wondering what to do next. I rounded up the local Inspector de Pesca and got our papers straightened out. By the time I returned it was 9:00 AM and the surf was murderous. Frank and I and a fine old fellow named Andy Tomlinson made a tour of the beaches to try to find an alternative landing spot. We found one where the surf was low but we couldn't get the truck down to it. I was mightily worried for fear the water fleas (isopods) would kill the big fish as they wallowed in the shallow water near the shore. We had lost fish to these little devils before. They simply chew a trapped animal to death. So it seemed imperative to land the fish somehow. The surf didn't go down, so finally I decided that Boots and I should go and look at the car and the fish and then decide whether we should tow them ashore regardless of breakers or leave them at anchor. We made it through the surf though it was frightening seeing the big swells loom up out of the dark. The water at the car was so dirty I could see nothing in it. Usually the water fleas swarm under a light at the surface and none appeared under my flashlight beam so I felt better on that score. A little poking with a bamboo pole showed that the fish were alive. So Boots and I hauled up the anchor and towed the car out into deeper water. I dropped the anchor what I thought was a safe distance away from a little fishing boat. The darkness muddled my judgment on this. Back through the surf (which is much worse than going out) safely and then to bed, feeling heartened to know that our animals were OK and in deep water. We just hoped the surf would drop for the morning high tide.

May 1, 1955

San Felipe, Baja California del Norte, Mexico

I awoke this morning with the wind blowing a gale into my sleeping bag. It was coming directly from the east. Frank and Boots had been up earlier and were walking around peering at the waves beating on the shore. There were about four lines of breakers. The water was coffee-colored and so dirty that you couldn't see an inch in it. The air smelled of dead fish. The Mexicans toss all the interior workings of their totuava back into the surf after they clean them and there must have been quantities of rotting material on the bottom. Frank and I had a stewing session trying to figure out what to do. We decided to wait until the tide came up a little to see if the surf would drop. Before long the wind began to switch to north east and as the tide rose the outer lines of breakers dropped and disappeared. We went up to another beach to see if we could land there and decided we could so off we went to gather all the gear together. Back at camp the breakers had subsided so much that we decided to try it here. The wind had swung around to the north and the seas were calming. Off Boots and Frank went through the

surf to the live car, which we could see bobbing offshore. I got the truck ready with Jim's good help. Before long they reached the surf. Frank threw out a lot of excess tow line and the skiff came free through the breakers. We beached her in a hurry and began hauling on the live car line. Before long she was wallowing along the water's edge with water running out of her ports. Frank told me that I had put her too close to the boat anchored near her and that the anchor lines had become twisted during the night. Apparently they had swung around each other without doing any damage. Just plain lucky, that's all.

Finally we got the tow line attached to the truck and began putting a strain on it. Frank and I jumped into the live car and began catching the big fish. We put them into a stretcher and handed them out to the fellows outside. We had about 30 American fishermen and some Mexicans helping us. They were run up to the truck and slid into the tank. The waves repeatedly broke over the live car so Frank and I got soaked. The car would lift from the bottom with the waves and bend and creak. After hauling it ashore we found that the keel had been cracked in the process. Finally everything was loaded and we all breathed a mighty sigh of relief. None of us had had too much hope of getting the big fish into the tanks alive. We packed, had a little lunch at Herman's, and left.

The skies were filled with thunderheads as we drove toward the border. Over the coastal mountains we could see great blankets of clouds topped with a halo of cirrus. It reminded me of summer afternoons in New Mexico. Here and there the rain was falling from the clouds in wide columns. I enjoyed this ride a great deal and reminisced about my summers in the New Mexican deserts. All this peacefulness was quite a change to the hectic events just past.

At Olive, Boots and I checked the tanks and found our fish still doing well. We drove into Marineland at 1:15 AM under heavy storm clouds. The fish were hoisted and we all had the final satisfaction of seeing them swimming in the tank. Battered but swimming and with every chance of surviving.

May 3, 1955

White Landing, Santa Catalina Island, California

This trip was to be taken with a photographer who was to take pictures of a soupfin shark fishing trip. At 8:30 Frank came alongside Marineland pier with only Boots aboard. I think they were somewhat relieved that it wasn't going to be what they call a "Charter Party" or a trip with photographers or writers aboard. We launched the live car from the pier and tied it astern. The speed of the *Geronimo* is about twice that of the Mexican boats with which we are used to towing the live car. It swashed and slid from side to side until Boots tied the heavy skiff astern of it and then all was well.

The day was completely cloudy and quite calm. The trip across the channel to Catalina Island was uneventful. No porpoises were noted and only a very few blue sharks. Frank told me that it was just two days past the new moon and that we could expect big tides and currents. This he says, usually means poor fishing, but we shall see.

We made our landfall on Catalina at a point called "Shag's Roost"—named in honor of the hoardes of cormorants which sometimes roost there. One of our tasks was to catch a dozen lobsters for Dr. Bullock at UCLA. He is doing some physiological work on the nerves of these critters. If fishing is good we would like to take back some for the

circular tank. Frank thought the local poachers would probably steal our traps if we left the floats above water so he had Boots tie the float lines so the floats sunk about 3 feet beneath the surface. We placed the traps very close in to the shore at a place Frank said was crawling with lobsters.

Leaving the traps thus submerged we cruised along the shore toward the east end and Church Rock. We passed through some schools of bait which Frank and Boots estimated would sink our boat. As we approached the east end a large swell came up and the water nearshore became a milky-white, like skimmed milk. We hopped in the skiff and rowed until we were just outside the breaker line. The net (9-inch cotton gill-net) was laid parallel to the beach in the murky water. We then commenced running the net by cruising up and down the cork line looking and feeling for places where the corks had sunk or the net was bunched. These signs meant a shark had gilled. We finally found one ear the end of the net. It was a 5-foot male soupfin. This is an unusual occurrence as the males are normally taken in deep water. The poor shark had rolled over and over in the net and was nearly dead when we untangled him. He came to slightly in the boat tank and began swimming slowly around the tank. More sets netted us nothing. I insisted on pulling the whole net myself once just to get my hand in and to earn my dinner.

Gad, what a job. One needs to be in condition for that sort of work. My forearms were tight as drumheads when I got through. Thank goodness the net was no longer.

Rather dejected, we turned for the lee of the island and shelter. I could hear Boots cussing softly in Italian. He takes these little fisherman's setbacks very seriously.

Dusk had begun to settle over us as we got through the calm water enroute to Turquoise Springs. Fog rested on the crest of the island, spilling down the canyons, patches of sky were turning red as we dropped anchor. I quizzed Boots about the various types of anchors. He informed me of the workings of Northhill anchors, Stock anchors, Danforth anchors, and the like. Our anchor, it turned out, was what Frank called a "genuine anchor"—with the accent on anchor. One feels sort of safe not placing his trust in some unknown geezer named Northhill or Danforth, but in a GENUINE anchor. I know it weighs about 30 lbs. and takes a good heave to get it over the side.

We made a set for leopard sharks and while Boots and I were working the net, Frank cooked dinner. We ate up the fare which had been brought along for the photographer and our own too. I took a short row for the exercise of it.

The genuine anchor was hauled up and we cut on up the coast to White's Landing where we tied the boat up to a mooring which was reserved for a yacht named the *Endymion*. I'm sure it's 80 feet long, mahogany throughout, with suave waiters. The *Geronimo* is much more my speed. Anyway, the *Endymion* didn't show up so we rocked at anchor undisturbed for the night. At times the boat was surrounded by swarms of small fish—smelts, sardines, and flying fish.

When we had made our try for leopard sharks I enjoyed the sight of two old bald eagles standing imperiously on their nest which capped a rocky crag about 300 ft. up the face of a cliff. We saw the silhouettes of herds of goats and kids picking their way along the crest of this cliff.

I didn't sleep too well—it was warm in the forecastle and my long johns were too short so I had to sleep in the semi-folded position. I was too sleepy to get up and take them off and not sleepy enough to doze off anyhow. What an impasse. It was finally resolved by the alarm at 4:00 AM.

May 24, 1955

Marineland, California

Up came the genuine anchor, the motor started with a gentle roar. We slid out into the dark water while the Fish and Game patrol boat cruised by, flashing its spotlight on the cliffs. I presume they were looking for poachers.

The tide was low and our floats were at the surface when we got to Shag's Roost. The water was so shallow and the traps so close to shore that Frank had a ticklish job getting in with the *Geronimo* but he did it without a hitch. We hauled up the traps and they contained over 50 nice lobster of all sizes. A few moray eels squirmed in the midst of the flapping lobsters. We put the lobsters in the boat tank and left for Church Rock. On the way Frank told me about some of his fishing exploits. One time he decided to go flying fish fishing. This is done with gill nets which are strung on the surface. One net of specified length is allowed per boat. Frank found he couldn't make a living with one net so he asked the warden about using more—no dice. Frank told the warden he was going to beat the law and the warden said "try". Frank then got two skiffs, gave them each numbers and set a shot of net for each skiff. This made three for him. The warden consulted the State Attorney general and found that Frank was quite legal—so long as he didn't hook the nets together. Ah well.

The surge at Church Rock was big again and our net sets gave us nothing. We fished at a place called "The Palisades", which is a long, 300-500-ft.-high sea cliff carved out of naked rock. It apparently is the result of faulting and earthquakes. In various places one can see old stream canyons which end high on the cliff. They were formed before the uplift and have been cut off too rapidly to cut down to sea level.

I felt a little woozy and went below to take it easy. This is the best cure for me when I feel tis was.

Around the west end we went and into a little cove marked by a barely submerged rock called "Tacoma Rock" in memory of a boat by that name, which ran aground and burned on the rock. We went prospecting for leopard sharks but found none. Frank's bad phase of the moon surely proved true this time. He said the fishing would change in 3 days or so when the quarter was reached.

I hopped ashore and investigated a midden which I could see topping a nearby bluff. It was full of bowl fragments of the island Indians. These were all of steatite or talc. Some slight excavation had been carried out, judging from the holes. Down the cliff I pulled up some succulents (*Dudleya*) for Phylly's forthcoming rock garden. We left for Marineland and about three hours later, arrived at the pier. On the way across we had seen practically no sharks and two Pacific white-sided dolphins.

May 29, 1955

Pushawalla Oasis, Riverside Co., California

We started out from Van Nuys at about 7:30 AM (Bob and I) and met Glen Miller in Corona. The sky was overcast and the air cool. By the time we reached Cabazon in San Gorgonio pass the sun had come out and the air was hot. We could see the hot whiteness of the Coachella Valley below. At Snow Creek we stopped for sand samples

and I found how unused to the heat I had become. The slightest exertion was a vast effort. I was very short of breath—with a sort of oppressive little headache.

Down in the valley we criss-crossed the desert taking sand samples at various places to show the transition from large-grained sands at the upper end to fine sand at the lower terminus of the dune deposits near Indio. We found one series of dunes east of Garnet which apparently have accumulated over seepages from the San Andreas fault which runs through the valley at that point. In another place we found windrows of wind-blown gravel. It was nearly 2 mm. in grain size diameter.

Up we went to the entrance to Pushawalla. At the end of the paved road we stopped and Bob put big 4x4 blocks between the axle and frame of the Chevy sedan we were driving. I let out some air from the hind tires and off we went up the wash—thumping and bumping. The blocks prevent the wheels from chattering but they make the car bang constantly. We bogged down a couple of times but managed to get the car nearly to the lower end of the stream. We made camp and Bob and Glen tried to get the car turned around and freed from the sand. I was too far gone to work in the 110 degrees so I flaked out on my sleeping bag in the shade of a nearby palm tree. Finally the car came out and sat high and dry in the middle of the road, pointing downstream. Little white-throated swifts skimming through the air. They slipped along above the vertical walls of the canyon.

These little birds are about the most graceful of all birds. If I were a bird a swift would be a high choice on the list. Down the canyon the red-tailed hawk's nest was occupied and we could hear the screeching of the parents up and down the canyon. Doves were everywhere. After a wonderful supper—steak, potatoes, and onions, peas, and pineapple—I prepared to start my toad census.

The toads were calling quite well for the first time during my visits this year. I had wonderful results and had too many toads for me to handle. I caught a male *Bufo cognatus*, the first toad of any other species but *B. punctatus* that I have ever seen at the oasis except for the tree toad, *Hylla regilla*. It was taken just below the main oasis. It escaped from its jar during the night. At about 12 midnight I went off to bed under cloudy skies. All around my sack I found toads hopping, even though we were camped 150 yards downstream from the end of the water.

May 30, 1955

Lone Barchan, Imperial County, California

It was showering lightly on us when we got up at 6:30 AM. The skies were full of thunderheads and it was delightfully cool. The big drops stopped after a while. After breakfast we bumped down the canyon, making it easily this time. Our destination for today is Lone Barchan, a single crescentic dune that rests on the floor of the Salton Basin west of the Salton Sea. It is just below the old sea level line. After a little reconnaissance we dropped down into Tule Wash and drove along the hardpan bottom. It was like a paved highway in places. This arroyo is one of several which cut up across the old lake bottom toward the divide between the Salton Sink and the Borrego-Clark Lake area. It is winding, steep, mud-walled and nearly flat-bottomed. At one point we passed a group of tules for which the arroyo is named. They are clustered around a very much mineralized seep in the stream bottom. Up the wash we went about 3-4 miles until we came to the base of the Lone Barchan.

This dune dips one of its cusps into the stream bottom. It is a very interesting dune of the so-called moving-dune type. It is crescent shaped. This one is roughly 700 ft. across the tips of its cusps, and perhaps 40 ft. high at the center. I sampled the dune at various places and scared out an *Uma* and chased him across the arroyo to a rodent hole. I poked in the hole and dug it out. Finally I saw something squirming under the sand. It didn't act like a lizard so I refrained from grabbing it. Shortly a tail poked up out of the sand with a rattle on the end. It was a little sidewinder rattlesnake who had taken to the burrow for shelter during the heat of the day. The snake was bloated and later I found that it had swallowed a very large adult male *Uma m. notata*. We surveyed the dune front and found that it had moved appreciably since our last visit. The southern cusp had whipped back a little and the main drop slope had moved forward a little.

The day got so hot that the numbers on the stadia rod started to jump, and we had to cease operation. We took shelter in the shade of the arroyo wall. There was little shade. I saw a better spot down the creek a little way. It was enticing enough to roust me up in the heat. I carried my tarp down and spread it out in the shade. The others were about to join me when I looked in a crevice about 2 ft. from my nose and there sat a nicely coiled sidewinder peering out at me and the heat. I poked a thermometer under him and found that he was in 29.9 deg. C air and we were in 38.0 deg. C. air. He certainly had the right idea. However comfortable he was I didn't want him 2 ft. from me while I was trying to rest, so we hauled him out and did him in. Glen took his rattles. This place seems to be full of the varmints.

After we had sat in the shade for an hour or so, the wind came up and began to blow our maps and gear around. We stowed everything and sat down again but it got worse and worse and began to whip up the sand. I guess it had gusts up to 30-35 mph at times. It was most unpleasant sitting with the sand and grit whipping all over. We retired to the lee of a clump of *Tamarix* downstream. I set up a tarp to divert some of the sand. We hoped the wind would abate toward evening so we could finish our surveying. Even with our shelter the fine sand sifted onto us like flour. We were all dusted thoroughly and had sand all over us. I walked upstream and to the lee of the dune. I had the excitement of actually seeing the dune move.

In the center of the crescent the air was comparatively still, unlike the gale outside. I looked up toward the crest and could see a sort of sand corona or halo along the crest, where the wind whipped over the top. The top of the ridge could be seen to become fluted and build up until finally it went out of equilibrium and a section of sand began to slip down the drop slope. The little sand slide moved noiselessly toward the bottom and finally piled up there. That portion of the dune had moved forward an eighth of an inch. The crest was now straight and began to flute again. So the cycle went. It was majestic in a way to see the dune actually moving in its own incredibly slow geologic manner across the desert.

After some more sitting in the sand and getting sand on top of our sand, we finally decided the wind was not going to drop enough for us to work so we piled our gear into the car and drove off down the creek. Getting out of the steep-walled arroyo with the car required a little Barney Oldfield driving to make it but, thank goodness, we didn't have to excavate any new roads in all that heat. We bought a little ice and some milk at Westmoreland, after passing across the sand storm in its full fore. The windshield got pitted a little and we were on the verge of turning on our lights. The main sand being

blown passed right along the axis of all the barchan dunes in the valley. The skies were filled with dust everywhere.

Off we went to Split Mountain Canyon, which was the nearest shelter we knew of where we could have a calm and sand free camp. It was beautiful in the canyon with its 700-ft. vertical sandstone cliffs, and I guess much more beautiful than usual because it had not a grain of windblown sand. After a minimum of the usual after-dinner yak yak we went off to bed and all had a nice sleep.

June 1, 1955

Home

Up at 6:30 and after breakfast we drove toward home. At Benson Dry Lake we stopped and hiked up toward an interesting dune mass tucked on the hillside (east slope of the large butte overlooking the lake). As we walked up toward the sand the wind was strong and at our backs. It died down as we approached the dune and when I reached the other side it blew strongly in the other direction. The dune apparently is deposited in this spot because of this wind situation. I saw no *Uma* though there were some tracks. The trip home was uneventful.

July 14, 1955

Catalina Harbor, Santa Catalina Island, California

Frank and Boots and Mac and I shoved off from Fleitz Landing at about 6:30 for Catalina. We are on a general collecting tour—looking in particular for specimens for the jewel tanks and for white sea bass.

We cruised out of the harbor under what Frank and Boots call “albacore weather”—high scattered skeins of cumulus clouds and warm weather.

The seas were quite calm and pleasant so I failed to come down with my usual seasickness. About 8 miles out from the light we came upon a patch of floating kelp (*Macrocystis*) and took a sharp look under it—sure enough a school of blue perch (*Medialuna*) could be seen hovering under the canopy.

The channel water was markedly green and nary a blue shark was seen until we reached the island. No porpoises showed themselves.

It is always exciting to me to round the west end of Catalina Island and cruise along the sheer cliffs and barren coast of the windward side. It has a sinister appearance to me—swells crashing in against the massive cliffs and water dropping off to a deep blue a few feet from the shore.

To add to the scene we saw a great blackish bird flapping along on sepulchral wings, landing on the knife edge of a steep spur, looking down on us. It was an immature bald eagle.

Frank took the *Geronimo* in and out of the precipitous coves at the edge of the kelp. No sea bass showed themselves. We rounded the wave-tossed reef at the entrance to Little Harbor and slid into the calm, opaque green water behind it.

The hook was dropped while we rode at anchor. Frank produced a fine spaghetti for us.

Little Harbor is far different from the western end of the island. The back hills drop gently into winding canyons with broad sandy floors back of the bay. Pretty

beaches rim the harbor and behind these flats clothed with *Juncus* and saltgrass stretch up the canyons. A few small rocky headlands break the landscape. It is calm and beautiful and inviting. Frank tells me there is a fine ranch nearby.

After lunch was finished we pulled the anchor and cruised on down the coast, peering at the kelp beds to no avail. A little farther we saw a group of gulls working along the edge of the water. As we approached Mac called, "Look at the fish." Boots said it was a big "black spot"—a fisherman's term for a heavy school, which appears as a black spot on the surface. The school extended along the beach for perhaps 75 yards and from the low breaker line to about 100 ft. offshore. The fish were nearly solid in the water. Frank said the school went clear to the bottom. "You can always tell this when the top fish are forced clear up to the surface." The two Franks estimated that there were at least 100 tons of anchovies in the school.

We could see the school part miraculously and a big bass would rush up into the void. The edges of the school shifted like rapidly streaming pseudopodia. I noticed that the fish in the parts of the school that were calm, face in all directions and were scattered farther apart. The frightened fish on the periphery were densely packed and reacted in perfect unison.

On down the coast we went until we came to a place where Frank pointed and said, "See that black spot there—there's at least 5 tons of seine leads down there." I asked why and then was told that the black spot was a submerged rock and that fishermen repeatedly set their seines around it, thinking it was a deep school of fish. Frank said there were usually schools of blacksmith and yellowtail around it. Sure enough, we spotted one big old yellowtail which must have weighed well over 20 lbs. He had what looked like a gaff mark on his side. We watched him for a while and then went on down the coast toward Ben Weston Point where Frank said the harbor seals hauled out. We saw a few jiggling themselves down into the water.

We turned around and returned to Catalina Harbor. Mac and Boots and I jumped into the skiff and loaded the diving gear. Near the west side of the entrance we slipped over the side and began searching for specimens in the kelp bed. It is difficult to describe the scene we swam through as there is nothing on land to compare it to. The big kelp (*Macrocystis*) filters the light, casting the scene in rich, bright amber shades. Tall columns of twisted strands of the kelp sweep up from the bottom, bending in the tide, and sweeping back and forth in the surge of the waves. The cliffs above the water tumble into the sea and below the surface the gray and brown rocks are carpeted with a dense feathery matting of many species of algae. There were dark pink tufts of *Gelidium* and coarser light pink and violet *Corallina*. Close to shore the bright yellow brown beds of *Cystoseira* took over. Down deeper the little trees of *Eisenia* were to be seen. These are a beautiful brown in color. Springing from a single stalk they end in a tuft at the top.

In places the rocks were coated with a solid mass of worms (serpulids?). The usual conception of a worm doesn't include the concept of beauty. But that was predominant with these delicate creatures. Each ended in a little rosette of brightly colored tentacles—dark indigo blue, reds, cream yellow, and white. When I touched the worm colony with my hand and when I swam by, their little heads would pop in and disappear. Down deeper, near where the rocks shelved off onto a gently sloping sandy bottom, we found real forests of gorgonian sea fans. They looked yellow to our eyes at 30 ft. beneath the sea but at the surface they were a deep henna color. In the patches of

sand we saw many little gobies (*Coryphopterus*) and captured a few by chasing them into a little nylon diving net.

Other fish we noted were the beautiful young of the garibaldi—bright orange dotted with brilliant iridescent blue, red-striped convict fish, senoritas, various perch, and many others. I found a couple of old whisky bottles which had become encrusted with algae, bright-colored bryozoans and tunicates. They were quite beautiful and I saved them.

Back at the boat with our booty, Mac and I decided to go investigate the wreck of an old abalone tender which juts out of the water on the west bak of the harbor. We climbed around on its sloping decks for a while and found that what Frank had said was true—"That wreck has been salvaged 250 times before you guys got here."

Back at the boat we loaded the beach seine into the skiff and waited for the tide to come in. As the tide tipped at high we set the net in the water at the head of the bay and caught quite a lot of fish—one small white sea bass (20 in.), several species of perches, and two thornbacks. We made two sets and returned to the *Geronimo*. Frank produced a nice dinner. Much gassing about this and that followed and finally we went to bed.

July 15, 1955

Johnson's Landing (Emerald Bay)

Up at dawn. We piled out and loaded the skiff and rowed ashore onto the long, cobbly beach just west of the wreck. There we made a set with the big nylon beach seine. As the net came up toward the beach we could see a big brownish blob in the water. Finally as the net was beached we found the blob was composed of about 30 big bat rays all congregated in the bag. We tied the bag and rowed the whole affair out to the boat with the bag dragging in the water, flapping and squirming. On board we selected out a series of opaleye and a few of the bat rays, put them into the tank and gave the rest their freedom. Mac wanted to inspect the shoreline for young opaleye so we walked the beach finding a very few.

We did find an old anchor chain which was very artistically rusted solid. I demanded that we take it back as a decoration for the oval tank. It had been a mooring chain for an old albacore processing barge which was anchored in the harbor back in the twenties. It was a beastly thing to handle as it was rusted solid and would not coil up but stuck out at odd angles. Beside that it weighed at least 250 lbs. We made it though and lashed it to the deck of the *Geronimo* and were off around the west end into the calm lee waters. At Tacoma Rock we stopped and I made an exploratory dive to see what sort of bottom was to be had. On the way I picked up about 10 abalones (Pinks) with a screwdriver. The bottom was an incredibly dense jungle of all sorts of algae. It was so thick that in most places no real bottom could be seen. I suspect that in 30 or 40 ft. of water it would have been clearer. The surge from the west end must be a factor in producing this luxuriant growth. Beautiful though it was I decided that we would have much difficulty in locating and catching fish in the jungle.

Up with the anchor and down the coast we went toward Arrow Point. There Mac dove around a pretty little rocky reef which was entirely surrounded by a plain of sand. The little underwater island was teeming with life and we caught a few small fishes. I spent most of my time skin diving and shinnying down the kelp columns while holding my breath. At one point I dove down to Mac, who was poking around among the algae at

the bottom. I peered into his faceplate upside down and startled him a little. He led me off and showed me a big kelp fish hidden in the growth. Shortly we climbed into the waiting skiff and returned to the *Geronimo*. There was Frank fishing with a hook and line in the midst of a large murky area of chummed water, a very odd attitude for Frank, who has never owned a fishing pole.

We cruised off toward Emerald Bay. The Cal Fish and Game Boat *Marlin* was there with a group of divers. We pulled up alongside and talked with them. Then Mac and I rowed to the lee of Indian Head Rock and I dove down to look the place over. I dropped beneath the surface and looked into one of the most startlingly beautiful underwater scenes conceivable. Algae were everywhere—the large kelp, the small encrusting species and the busy types—greens, iridescent blues, coral reds, topaz, greys, and yellows. Little avenues of clear sand wandered among the kelp toward the edges of the bed. Whitish rocks loomed up dotted with long-spined bluish-black urchins. Out on the flats I saw dozens and dozens of tube worms poking up from the sand. They ended in a circlet of tentacles about 2 inches across. All my attempts at digging them out failed. Their tentacles were of several hues—reds and buffs mostly.

Fish were everywhere—there were swarms of cigar-shaped senioritas milling among the kelp columns. The perch were there as well—little seven-eleven perch (*Cymatogaster aggregata*) were seen in their breeding color. The males were nearly jet black while females were dark reddish gold with a few scales of bluish caste. Under nearly every rock little white gobies (*Coryphopterus*) could be seen poking their heads out. Their eyes and the tip of their first dorsal fins are jet black and look like little black pebbles until you realize that they are part of a fish. Down in the deeper waters I found the little blue-banded and zebra gobies common. These are two of California's most brilliantly colored fishes and rival anything found on the coral reefs. The blue-banded goby is a bright scarlet orange dashed with vertical bands of iridescent blue. The zebra goby is red and is lined with many vertical lines of dusky blue. Both are small—reaching about one inch. The blue-banded fellows were almost always first seen as they perched on top of the white rocks within inches of the spines of the urchin (*Strongylocentrotus franciscanus*). When disturbed they would skip into the retreat of the urchin spines. The zebras were more often found in closer contact with the urchins. Usually they were hanging upside down at the top of the recess dug in the rock by the occupant urchin. They too retreat into the urchin when danger comes. If the urchin is removed the goby leaves his retreat and skips over the rock surface to another urchin or a nearby crevice. It was terribly frustrating trying to catch these elusive little fellows with a diving net. They had no intentions of going into a white nylon net no matter how hard we tried to persuade them. I did finally catch two.

Mac and I finally rowed back to the *Geronimo*, much exhilarated by the dive and the sights we had seen. There a fine lunch was waiting—abalone chapine cooked to a T. The abalone was the most tender I have ever eaten. Frank had bashed the critters with a 2x4 on the stern of the boat.

The Fish and Game boys were skin diving over toward shore and came up with a bottle containing a peculiar fish. Mac and I rowed over and identified it as a fringehead. It is one of those peculiar blennies which is able to open its mouth to an incredible size during combat. The rear ends of its jaw bones are only loosely attached by means of a membrane. When the fish opens its mouth this membrane is stretched out full—it is

bright yellow inside. The combat of these fish is probably mostly intimidation display though their considerable array of sharp teeth suggest that they may actually make contact on occasion.

Further evidence of this is that when we confined 4 of them in a jar the smallest one was killed shortly. The divers brought up 4 of them, 3 in old encrusted Smucker's imported jam jars. I wonder if there is a social hierarchy favoring the imported jar homes?

I went down later and peered into several dozen bottles and cans and found nary a fringehead. To be sure I found no Smucker's jam jars either. I came up with an old bathing suit, a broken frog spear, some sea urchin shells, a couple of rifle cartridges, a knife and fork, but no fringeheads.

Later Bill and I made another pair of dives out by Indian Head Rock. We both saw moray eels poking their malevolent heads out from among the rocks. I prodded one with my screwdriver and he snapped at it.

We were both thoroughly fagged and dried off and changed clothes. A couple of young boys sailed by in an 8-foot dinghy which had a mast and a nice little sail pushing it. Later we saw them apparently foundering and rowing back. As one boy pushed at different times than the other, and harder, the boat was wiggling around in a most frantic and aimless manner. Bill and I leapt to the rescue in the big skiff. I offered them a tow line. "Drop dead" was the reply. We found that it was their first time out in their own sail boat and no help was even to be thought of. We retreated hastily.

Mac dug succulents for his horticultural wife. I had already dug succulents for my horticultural wife on a previous trip. We were nearly overrun by a herd of passing boy scouts.

Later we took Frank and Boots and rowed ashore to Camp Emerald Bay. I had attended the camp as a young boy scout back in 1938 and it hadn't changed a bit. The same mess hall—the same bunk house where my "putrid polecat patrol" had bedded down. We talked to the 6'5" camp director—a fellow named Mac David—and we found that even the routine was the same. They still fight over the green goddess and still haul certain members off into the hills and make them sleep out all alone. Mac David had been on the island since 1928 and didn't like the mainland. He did a fair amount of moaning though.

We talked about poachers and poachers' methods and Frank knows them all. The Fish and Game is now catching poachers by stationing men high on the hills with cameras and big zoomar telephoto lenses. They also have developed the splendid trick of finding illegal traps, pulling them, tagging the lobsters with inconspicuous tags, and replacing them. Then when lobsters are brought in they can tell easily who was the illegal fisherman.

Back at the boat ate a light supper and went to bed.

July 16, 1955

Home

Up at dawn. An uneventful trip home. No porpoises or blue sharks sighted.

August 6, 1955

Catalina Harbor, Santa Catalina Island, California

The channel was almost red in places near the San Pedro Breakwater. I think we are getting touches of red tide. Salps (*Salpa s.*) were scattered across the channel. Our crossing was calm and uneventful. No porpoises were seen and only one small blue shark was seen.

At Catalina Harbor we dropped anchor close to the *Stella Maris*, a boat about the size and shape of the *Geronimo*. This boat is populated by the Falconi Brothers, more popularly known as “the alcohols”. There are three of them, Paul, Batiste, and Augustin. Paul is called “Goat”, Angie is Angie, and Big Alcohol is Batiste.

After supper we went over for a visit with the Alcohols. Quite a crew. All bachelors and all pool their cash, giving it to their mother who rules them with an iron hand.

April 26, 1956

Guaymas Trip

This trip to Guaymas was planned for several purposes. First, we wanted to see if we could locate a source of small reef fishes to supply our tropical tank and jewel tanks. Secondly, we wanted to test our new transportation gear with a fairly long trip before trying really long distance transport such as carrying fish from Mazatlan, as we will have to do when we make an attempt to collect saw fish and nurse sharks there, later in the year. Third, we wanted to obtain a number of brightly colored fishes for the oval tank. My collecting crew was composed of Frank Brocato, Frank Calandrino, Bill McFarland, and myself from Marineland, and Dick Rosenblatt from UCLA. Dick is an authority on Gulf fishes and a competent collector and diver.

Most of the packing fell to Frank and Boots, as I was plagued with a siege of disease in the tropical tank until the time we jumped aboard the big truck and left. Frank and Boots went on ahead late in the afternoon in the Stake truck and Dick, Mac, and I left about 10:00 PM in the big transport truck. Bill Monahan was on hand to see us off, and while mumbling about the fact that our load had bowed the truck bed slightly, presented us with a bottle of medicinal spirits (Old Crow). This we tucked under the seat and drove off with the pleasant feeling that all emergencies were thus taken care of.

April 27, 1956

Dawn found us crossing the huge Algodones sand hills, east of the Salton Sea. The pale pink morning light heightened the impression that these clean sweeping billows of sand were ocean waves. Bringing us back to the reality of the desert were the fragments of the old plank road along the edge of the new highway. This old road was built of ties attached together with straps of steel. The constantly shifting sands of the dune mass have twisted and ripped it into a thousand upended fragments.

As we crossed into Arizona we were stopped by the Arizona State Highway Patrol and required to buy a temporary Arizona license for the truck. We dove on uneventfully, noting the cultural changes which occur as one leaves California and enters Arizona. Frank Sinatra was largely replaced in the juke boxes by Tex Ritter and Ernest Tub wherever we stopped for coffee. My attempts to convince my companions that this

western cowboy music was really modern folklore and should be treated as cultural, fell on deaf ears, I am afraid.

Late in the afternoon we arrived at Tucumcori Mission, where we found Frank and Boots waiting for us, as we had planned. Ten miles beyond we came to the border. Our permits were not complete so I anticipated a lot of fast Spanish and deep frowns and shuttling from one authority to another up the hierarchy, ending in a call to San Diego, where all would be clarified by a word from the higher resident god there. But no—Frank found what he described as “a genuine dago” in the midst of the officials. This Genuine Dago was named Bonfiglio and was about to have Frank haul out all the gear stowed in his truck. Frank discretely greased his palm with some green salve carried for the purpose, and I did the same with the little Mexican ordering me to unload the big truck. In a miraculous change of heart each official then marked big X’s on each box and off we drove, seven dollars lighter, but free to roam all of Mexico showing off our magic X’s. This is a magic called “mordida” by the Mexicans, and I guess, “cumshaw” by us. At any rate, my expense account shows the entry—“Mordida--\$7.00”.

We had driven for about 20 hours and I was willing to go a way out of town and make camp for the night, but Mac knew of a swell place to eat in Hermosilla. This town, which is the capitol of Sonora, he said was about 100 miles down the road. It proved to be nearer to 200 and we arrived late at night. I drove into the nearest place advertising “Comidas Mexicanas”. We had some of the most miserable tacos I have ever eaten and a skimpy plate of beans and cheese. The beer, however, was delicious as usual, this being one of the few really predictable things in Mexico. After this meager meal we drove south of town and pitched out the sleepig bags amongst the saguaro cactus. With swigs of medicinal spirits warming our interiors we dropped immediately to sleep.

April 28, 1956

About 8:00 AM we were roused out by the sun beating down on our sleeping bags. We returned for a fine breakfast at Mac’s pet restaurant. The town is one of the most beautiful in northern Mexico. It is a mixture of ornate Spanish cathedrals and new buildings of clean modern architecture. The Mexicans have a real feeling for modern architecture and are generally more daring in their approach than Americans, the Oceanarium notwithstanding. The desert climate makes the dense shade of huge Indian beech trees which line the sreetes a real delight in summertime. Unlike most other Mexican towns, Hermosillo sports broad clean paved streets over much of its spread.

Before long, as we drove southward, we could see the twin peaks of “Tetes de Cabra”, a mountain rising near our proposed camp site. We chattered seven miles out over the washboard road toward the peak. The road skirts the broad crescent of Ensenada Bocoibamp (Bocoibampo Bay) and ends at the nearly landlocked lagoon called Estero de San Carlos. We cut off the graded road on a two-rut trail that led down to the shore, just before reaching the lagoon. Frank and Boots were delighted with the camp spot we found. The others of us had visited it several times before and so were not surprised at its beauty.

We had our own private harbor, a little cove between two fingers of rocky land. Our camp was made in a crescentic hollow in the cobble berm about 75 ft. from the shore. The water was crystal clear and perfectly calm. No waves lapped at the shore. Back of us, rocky hills covered with saguaro cactus and a dense growth of euphorbias and

mesquites rose to the main mass of precipitous purple desert mountains. Occasional patches of native desert *Washingtonia* palms could be seen in the washes, where water came near the surface.

While Frank and Boots made camp, Mac and Dick and I drove in toward Guaymas to attempt to make contact with the Inspector de Pesca there. This man has no visible function, except to be official, but he must be catered to. We also wanted to locate Johnny Nash, the photographer who was to record our various photogenic doings for posterity. We found Johnny pounding along the dirt road toward our camp. We gave him directions, and went on into Guaymas, where the Inspector was not to be found.

Back at camp the collectors had strung a big canvas over a little stumpy tree and tied it to the truck. It gave us a nice big hollow of shade. We built platforms in the rocks and lined our gear boxes around under the canvas. Lanterns were hung from the tree and nails pounded in for cup hooks. The boats and live car were launched and anchored. Before dusk we took the skiff around the east point of our harbor (Punta de las Cuevas) and set the seine twice for bait, to no avail. We caught a very few small nondescript fish and returned to camp. After dinner we rigged the fishing poles and put on some salt mackerel and squid. None of us even got so much as a nibble, even though we fished until nearly midnight. One fishing pole inadvertently fell overboard when pushed by an oar. The water was unseasonally cool, a sign which might mean that many migratory species would be absent. To bed a little dismayed. We had seen the patron saint of collecting trips, Dr. VanDenburgh, in Nogales, but he looked peculiarly prim and well kept. His beard was large and white, but neatly trimmed, and he was jauntily carrying a cane. He is usually a jovial slovenly tattered mess with whiskers flowing with the wind.

What all this might mean we were not sure.

April 29, 1956

Up before dawn, and as is Frank and Boots's custom, ate no breakfast. We loaded the skiffs with diving gear and set out to make an underwater reconnaissance. Mac and I pulled on our rubber suits and took turns diving over various areas for 2 or 3 miles along the coast, looking for the best fishing grounds. West of our camp, beyond the entrance to Ensenada Bocochiamp, the water deepens abruptly and we could operate only very close to shore. Nevertheless, we were able to swim up a number of underwater channels and corner numbers of groupers and schools of a striped grunt (*Haemulo sexfasciatum*). A few schools of bright yellow and black sergeant majors were seen. About 5 Gulf sheephead were seen. These are pretty fish with long trailing fins, a species we wanted badly for the oval tank at Marineland. At one place I dove among heavy columns of sargassum weed and was able to swim down and touch the dorsal fin of a 30 lb. grouper which lay nestled in the vegetation. Experiences like these make me wonder where the sport lies for skin divers who spear these docile creatures. Many other species are approachable enough so that one can swim within 3 or 4 ft. without frightening the fish away.

Among the sargassum columns were many knobby calcareous algae castles, protruding up through the foliose algae like so many stalagmites. This particular stretch of bottom was among the most interesting we saw. The wind chop had begun to pick up and we had seen very little of the kinds of fish we wanted so we turned the boats back toward camp and rounded Punta San Antonio at the entrance to Bocochibampo. Just east

of the entrance Mac inspected a little cove and came up announcing that the bottom had many pretty brilliant blue *Pomacentrus rectifraenum*, a species of damselfish.

We entered the mouth of Estero San Carlos and dove along its rocky shore. Mac saw a few nice snappers, including *Lutjanus argentiventris*, a species with a red back and a yellow belly and tail. We had hoped that the warmer water of the Estero would perhaps have attracted various brightly colored species, but this did not seem to have been the case. In one shallow neck of the lagoon Mac and I cruised over the bottom and saw many interesting small fish such as smooth puffers, Trypterygiids, and gobies. These however, are of relatively drab coloration. While the others took the boats back to our harbor, Mac and I walked overland into camp, a distance of about ¼ mile. I had forgotten to get my shoes before the boats left and so had to pick my way slowly among the rocks while Mac smiled superiorly down at me, from his vantage point up on his soles and heels.

Back at camp Frank, Mac, and Dick decided to go to town for some food. I took a hike up the wash in back of camp to get a look at the country, while they were in town. The vegetation is rather typical short tree forest with a strong admixture of desert species. The mesquites were good trees up to 30 ft. high. I saw the white paper barked palo blancos and the yellow scarious hielio trees. The moister spots supported scattered groves of palms, some in flower. On the nearly level alluvial benches bordering the stream bed were many fine specimens of a stubby little tree (*Forchameria watsoni*) with smooth white bark, very heavy, obese limbs, and a dense crown of long, slender, thick green leaves. Nearly every one of these trees had its complement of little lizards clinging to its bark and matching the color perfectly. The lizard was the ornate tree uto, *Urosaurus ornatus*. On the ground I scared up several little gridiron tailed lizards (*Callisaurus draconoides*), which curled their tails over their backs before fleeing.

Down in the hollows I saw a few *Pyrrhuloxia*. This species is a beautiful desert relative of the cardinal. It has a brown back and a dusky red crest.

After about 5 miles of walking I came into camp to find Boots and Johnny a little worried about my long absence. Boots and I decided to try the little gill net and so carried it to the skiff and cruised out into our harbor and set it just at dusk. We caught one small grouper and a Gulf opaleye, neither fish being very desirable. As we pulled the net we could see the lights of the stake truck bouncing along the road toward camp. Our skiff bottom grated on the cobbles of the beach just as the truck pulled to a stop in camp. Shortly Frank had a good dinner ready and Mac had constructed a good cooling drink from rum, ice, and pineapple juice. We relaxed and listened to Johnny's stories about the odd people he has worked with. He wanted to know why I had been collecting lizards, and I think we half convinced him we were going to cook them.

After dinner Frank and Boots baited and set the traps out on the rocky bottom off Punta de las Cuevas. Mac, Dick, and I went fishing. We stoked up the motors and headed for the cove in the lee of Punta San Antonio. We had been anchored for about ten minutes when I hooked up on the bottom and Dick tried to set the hook in an anonymous fish. His rod tip shattered and mine broke at the ferule. Three rods in two days and only one intact one left! Dr. VanDenburgh, why were you looking so dignified?

Fishless, we returned to camp at about 11:00 PM. Frank, who is not a friend of the roving rattlesnake or the crawling creature, had put his cot up on the tailgate about 4 ft. off the ground. He was puffing away, sound asleep when we crawled in.

April 30, 1956

Frank routed us out in the dark at 3:30AM. We stumbled over the loose cobbles and loaded the gill nets into the boats and then waded the bows out into the calm cove and scrambled aboard. In the black starry night of early morning our boats cut through the phosphorescent water. Half an hour later we hove to, outside of Punta San Antonio. In the early morning light Frank and Boots payed the nets over the stern of their skiff under the massive shadow of the 200-ft. vertical lava cliff of Punta San Antonio. This was the spot where Mac and I had seen schools of grunts and sergeant majors. We watched the bobbing corks for half an hour but not a fish was taken. Another couple of sets yielded two fish, one of which was a gulf sheephead. Two net sets in the Estero yielded nothing but a few tortillas (Gulf stingrays) and big diamond sting rays (*Dasyatis* sp.), all of which were thrown back.

All of this was very discouraging. I sat in the stern of the skiff thinking what to do. Frank sat in the bow of his skiff, looking long-faced. We hadn't caught enough good fish to sneeze at, the water was frigid, and we had even seen very little underwater. I finally called the skiffs together and said, "Let's pack up the kit and leave for Mazatlan, where we know there'll be fish." We chucked our two fish over the side and revved the motors up and headed for camp.

Boots stewed up a pot of coffee and Mac cooked us pancakes while we decided what to do next. A look at the map showed that it was 477 miles to Mazatlan. This was considerably farther than I had thought. This would make our run home almost 1,500 miles, and we were already attempting about the longest large-scale saltwater fish transport by truck that had been made. I was confident of our gear, but not that confident. Finally after breakfast was over and everyone was moping around, I said, "It's too far—we'll stick it out here and scratch for our fish. After all, we haven't even tried some of our most potent collecting gear, such as the beach seine." I tried to read Frank's face, to see how he was taking this decision. I couldn't tell, except that he was worried. He knew that we weren't really prepared for Mazatlan, where the surf is apt to be rough and gear has to be hauled over a 200-ft. sand beach, and isolated camp spots where gear can safely be left are non-existent—but I still wanted his valued opinion. Finally I felt that he agreed and we set out to plan our operation.

With Johnny and cameras on board we set out for the cove inside San Antonio Point, where Mac had seen the damselfish. I picked a little inlet and Frank and Boots set the gill net around it. We rigged up the diving apparatus and set out to try out the "slurp gun". This is an invention of Mac's and mine, which consists of a cylinder of plastic and a plunger. When a trigger is pulled the plunger is pulled up in the tube by powerful rubber bands. It was designed to suck up small fish. It worked quite well and before long we had a few small, brilliant blue damsels swimming in the tub. I saw some rudder fish and one fine old snapper wedged under a rock. Frank caught a striped grunt in the gill net.

We transferred operations around the point to a big tidepool. We raced over and set the gill net in the entrance. I jumped in the pool and shortly was rewarded with the sight of one of the most beautiful fish in the Gulf—an angel fish covered with brilliant iridescent blue spots and a bright orange tail. I poked at him and he rushed into the net—as simple as that! We spent the rest of the afternoon trying to chase two *Cirrhitus* into the

same net. These are bass-like fish with electric blue lines and jade green background color. No luck, but Dick did toss out about seven nice lobsters which Frank gathered into the skiff. I poisoned a small pool with rotenone, which Dick had brought along. This is a potent fish poison used by scientific collectors in gathering museum material. I thought if I could dip the fish up quickly enough and put them in tubs of clean water they might revive. I succeeded in catching about two dozen small fish, including some sergeant majors. Mac and Dick found another angel fish in an outside channel but could not dislodge him into Frank and Boot's net. Frank quickly named the angel fish a "Guaymas garibaldi". After a reconnaissance dive at a nearby island we started back to camp. Frank and Boots pulled the traps and brought in a snapper and a very rare species of eel, *Gymnothorax argus*. Our eel was the seventh known specimen, as I recall.

Back at camp Frank fixed the lobsters in a delicious chapino with tomato sauce and pasta. What a superb meal to have at sunset on the beach at Guaymas! We had Galleta biscuits to soak up the juice and a splendid McFarland cocktail (either rum, bourbon, or tequila in lime juice over ice). "This," we said, "beats working."

As everybody was pretty well bushed I called off a proposed night seining in favor of a little bull slinging contest and the good sleeping bag.

May 1, 1956

In view of the success in obtaining little fish by use of the rotenone poison method, I decided to try a deep poisoning, in hopes of capturing some of the deeper water forms. Many of these little fish are quite colorful and would make fine small tank material. I also wanted to carry out a more thorough poisoning of the big tide pool.

In order to catch the low tide, which came in early morning, I asked Frank to rout us at 6:00 AM. He is an excellent human alarm clock in the early morning hours. He didn't fail us and after stumbling out we consumed one of Mac's egg pancake breakfasts, loaded the skiffs, and cruised out into the calm bay. At the shelf surrounding the pool, Dick, Mac, and I put on our rubber suits while Boots and Frank rigged the diving gear and set gill nets at the entrance to a nearby underwater canyon. I started the poisoning while Mac and Dick went underwater in an attempt to drive several big Gulf sargos into the waiting net. They succeeded in capturing two of these pretty bronze fish. I picked up dozens of small fish and ran them through a rinsing tub and into a freshwater tub. The method proved promising as I was able to save many fish, though more died than lived. If I could somehow put the fish into cold water, where the effects of the poison are strongly inhibited, I would get much more success. As the poison constricts the gill capillaries and prevents the fish from absorbing sufficient oxygen, I think an oxygen aerator for the holding tubs would help a great deal. Some fish are so far gone when they are first picked up, however, that nothing would work, I suspect. We have a heavy alcohol which will anaesthetize fish well, but it will not work in open water like rotenone, and requires much more quantity to be effective. I used four double handfuls of rotenone for a pool which held an estimated 4,000 to 5,000 gallons of sea water. Dick picked up three more spiny puffers when we set the fine mesh gill net around an area known to harbor a fine school of sergeant majors. We were all dismayed, particularly Frank and Boots, by the fact that these fish would seldom gill themselves. All of us noticed that nearly every species retreated under rocks when disturbed. I chased a couple of small groupers over the bottom toward the net and had them swimming at a great rate before me. When they

reached the net, which is so fine as to be almost invisible, they abruptly stopped and fled under a nearby boulder. Nighttime would be the time to capture them but the colorful species all sleep under rocks or in the sand at night.

Puffers are a more satisfactory fish. They cannot swim very fast and when one is sighted the diver swims over it and taps it until it inflates and it then becomes helpless. It is then escorted to the nearest boat.

Over on the lee side of Pelican Island we tried a deep water poisoning. We mixed the poison into a doughlike consistency and I donned the Desco diving mask and took the poison cans down to the bottom, spreading great lumps of it in the crevices at the bottom of a 40-ft. underwater cliff, and out over a boulder field beyond. Frank tended the diving gear and Boots cruised the surface in the other skiff, picking up the fish as they flipped to the surface. Mac and Dick swam and dove from the surface, picking up fish in their fine-mesh diving nets. Many more fish stay on the bottom on one of these operations than appear at the surface, so I was very busy indeed picking them up off the bottom.

The bottom at the island is a luxuriant place. Many kinds of short algae species clothe the rocks. Sabellid worms retract their delicate radiating tentacles as one swims by. Some are white, others are reddish brown and of considerable size, the larger specimens having a tentacle spread of three or four inches. Gorgonian sea fans cling to the rocks under nearly every overhang. The venomous little white gorgonians were common. They deal out a rather potent sting to the unwary diver who brushes against them. Another dangerous denizen which I saw in some numbers was an exquisite sea urchin. This particular creature has extremely long, banded, black-and-white spines, which are as thin and sharp as a needle. The body of the urchin is set with five brilliant, iridescent blue specula. One has only to touch this creature and the spines become deeply embedded. They are quite painful and cannot be removed as they fragment when pulled with the forceps.

Many fish were recovered, including some nice specimens, but many more were dead. The poison has to be placed heavily to affect the fish before they can swim away, when a deep poisoning such as this is done.

It was dark when we finished and so we pulled the traps, retrieving a few small octopus, and went ashore. Boots cleaned the octopus by turning their bags inside out and removing the interior workings, including the ink sac. He then boiled the beasts for about 20 minutes, while Johnny looked on in obvious disgust. When the boiling was completed, Boots removed the skin and chopped the beasts up in sections, sucker discs and all. He constructed what he called a "dago salad" out of them. This consisted of the octopus, chopped onion, a little garlic, olive oil, and vinegar. A pot of hot coffee and the salad made up dinner. Johnny bravely chewed away on a couple of sections until our conversation got him and he retreated from the salad to the cold cut department. "Great flavor, this octopus, but Boots, don't you worry when the sucker discs stick to the top of your mouth?"—this was the sort of thing that drove him off.

Actually the octopus has a nice, delicate flavor which is distinctly seafood-ish but very different from everything else except squid. It is very rich however, and one cannot eat much. Tomorrow is a big day—so to the sleeping bag. There to be greeted by ever-increasing hordes of saltwater mosquitoes. These beasts are insidious. They don't buzz but bite like fury.

May 2, 1956

Up at 3:00 AM and into the skiffs quickly. Boots ran the small skiff and Mac the large one. Our goal was Playa de Bocochibampo, 7 miles away. This is a stretch of sandy beach which we wanted to seine for jacks. Our early start was to allow us to hit it at dawn, the best time for seining, as the fish cannot see the net and they are very often in close to shore at that time. At night the phosphorus in the water lights the net like a luminous fence, as it is being pulled ashore.

We watched the sun rise over our bows as we slipped along. At the beach we found the beach very shoaly but set the net anyway. Throwing the seine lines over our shoulders Mac and Dick and I pulled one wing onto the beach while Frank and Boots took the other in their own fashion. Instead of walking with the line they pull it in hand over hand. This puts most of the strain on your back and arms. Our method wears on the legs. At any rate the seine held mullet, numerous stingrays, one Gulf electric ray, a few smooth puffers, and a few small halibut. Not very good.

On our way back we detoured to a dome-shaped rocky island. I hiked over it looking for likely tidepools for our alcohol, while Boots and Frank worked the gill nets. My hike proved fruitless but they caught a few striped grunts and some trigger fish. We found a nice cobble and sand spit extending from the north shore of the island and set the beach net again. This time we came up with a nice series of porgies (*Calamus brachysomus*).

Back at camp by about midday we ate a belated breakfast and took it easy for a while. Mac and I crawled under the big truck where it was cool and breezy. The hour's nap was delicious. Summer came all at once this day as it was well over 90 degrees F. From our jewel of an ice box we produced some cold beers to assist our siesta. These had thoughtfully been provided by Johnny before he left for home, after his camera gave up the ghost.

In the afternoon Boots and Frank worked over their nets. Every set with the gill net produces some holes and snags and these have to be repaired before a new set can be made, so Frank and Boots were seldom idle. Dick and Mac spent a couple of hours observing the behavior of some small fish called Trypterygiids. Dick is writing his doctorate on these beasts and has been probing into their private lives for a couple of years now. I took a swim with the face plate but the water was still frigid and now had turned quite murky so I didn't stay long.

The dinner of broiled mullet was wonderful. This was accomplished over Frank's ice box shelf and a bag of charcoal he bought enroute.

After dark, back to the skiffs. We shoved off into the dark night to try to find our island and its cobble beach. I took the tiller and miscalculated grandly, getting us off our course a mile or so. Finally we slipped into the dove, cutting the motor to keep from frightening the fish. We had seen hundreds of rocket trails left by fish as they shot through the luminous water, away from our bows. Many of these had been made by flying fish and others by big rays. The latter make a great broad flash of cold light when they are startled.

Our set netted a school of bonefish, more porgies and a series of blue-lined grunts (*Microlepidotus inornatus*). The booty was ferried out to the waiting fish tank in the big skiff. With the dripping net and lines aboard we cut directly northward toward a long beach. We knew it harbored masses of algae but wanted another set badly. Frank and

Boots dropped the net into the water far offshore and we began pulling. It came hard and got worse. I estimate it took us forty-five minutes to get the net in. It contained tons of fragmented algae. We couldn't possibly beach it so we began to shovel the debris over the cork line with our hands. One of us saw something flap down in all the soggy pile. A broad tail emerged. It was a splendid adult pargo muleto (*Hoplopagrus guntheri*), a pretty bronze and gold species of snapper. Further search turned up five more of these splendid fish.

It was an hour's work to clean the net and stack it in the stern of the skiff. By this time the moon had risen and everyone was only too glad to hop into the skiffs and push off onto the calm moonlit bay. I took the tiller of the big skiff. All the hills and islands, so familiar by daylight, were distorted out of all recognition. The little cliffs of our Punta de las Cuevas looked like a huge, towering rampart as we approached our cove. The fish were dumped at the live car and the skiffs beached and hauled up above high tide line, the fish tank pumped dry and the usual bailing done. Then we trudged up over the cobble berm and into camp where our coal oil lamp was still faithfully burning. It was after 3:00 AM—just about where we started the day before, so the sleeping bag felt good and we all went to sleep in spite of the bloodthirsty mosquitoes.

May 3, 1956

Those xxx@@@!!! mosquitoes!! They have real discrimination—and it's all against me, as far as I can tell. I hope they drank a toast to my poor departed body as they sucked the last drop of blood from it. Nobody else seems much bitten or disturbed, even though I am sleeping right next to them. Those guys will be sorry when I'm gone—and I'm leaving. Tomorrow night I spend inside the fish tank on the big truck. Even the bug bane we have been using won't stop the beasts from feasting off all my more exposed parts. Enough of this hypochondria (hypochondria I say—I never heard of a psychosomatic mosquito but I suppose there's always time for a first).

Frank and I took the little trawl net and cruised about 3 miles down the coast to the long sandy beach. On our way Frank asked me if I had seen the porpoise. No, I said, where, what porpoise?? I stopped the skiff and we idly rocked in the swell for ten minutes, but the animal did not surface again near us. Frank said he saw it once. It weighed about 80 lbs., was black, blew with a loud "puff" and had a very small low triangular dorsal fin. This description perfectly fits the new species of porpoise which Mac and I have been describing. We suspected it was at Guaymas but did not know.

On down by the beach we plopped the trawl in the water and set the little shear boards. Our hauls were unproductive in general. We picked up a couple of pretty little flatfish (*Pleuronichthys ritteri*), a lot of algae and many specimens of the sharp-spined poisonous urchin. The day had turned steaming hot as we turned for camp.

Frank noted a group of skiffs working off of a low island. They had been in one spot for two days so we investigated and found that they were taking pargo (*Lutjanus peru*) in considerable numbers on hand lines using anchovetas for bait. At last—a source of snappers for us. We found we could buy bait and if the school only stays put until we come back in the morning we will have our snappers.

Mac and Dick had been diving and came back with reports of one crevice under a big boulder at Pelican Island which contained one Guaymas garibaldi and three *Cirrhitus*, the brilliant blue and jade green fish we have been seeking. After breakfast, Mac and I

decided to try to catch these fish. We took a small piece of gill net and rigged heavy fish hooks on the end of a short pole. With Boots tending both of us, we dove down. I swam to the rear entrance of the cave and was greeted by three beautiful *Cirrhitus* staring at me out of the crevice. I could almost hook them but not quite. Meanwhile Mac crept in the cave from the other side and set the gill net across it. I poked vigorously around with the hook with no results. After about half an hour we found that there was a cross channel which was inaccessible. Not so dumb, these cold-blooded vertebrates!

Dick and I dove around Punta de las Cuevas. I was most disappointed by the fragmented algae which filled all the caves and potholes. Dick, however, persevered, and came up with a nice little frog fish (*Antennarius avalonus*).

We dove around the flat island and I set the pole hook in a ice big Gulf sargo, but he struggled free. We did catch some nice spiny puffers.

Back to camp and a nice dinner of broiled mullet, and one of Mac's inimitable concoctions. Mac seems infinitely resourceful when it comes to mixing a drink. He will stop at nothing to find ingredients, it seems. In our case, after a hard day's net hauling, diving, and general boat pushing and gas can toting, they were all creations which knew no peer. Tequila, rum, beer, bourbon (nearly gone now), or pickling alcohol are all grist for Mac's mill. Limes, lemons, pineapple juice, orange juice, papaya juice, mangoes, bananas—it makes no difference as long as the master blesses the mixture.

General gear rigging and preparation for snapper fishing in the morning. I moved my bag up into the truck tank amid all sorts of derision. I suspect they secretly wondered what they were going to do for a decoy when I left.

May 4, 1956

Up with the first red streaks of dawn. Into the skiffs and off to the snapper grounds. We bought two buckets of anchovetas for ten pesos and soon had our lines on the bottom. We fished until about 10:00 AM and put 28 pretty red snappers in the live car, including one *Lutjanus guttatus*, which I hooked.

To the frying pan—with gusto—where Mac decided to make French pancakes. If he had only of had a little flaming brandy . . . ah well, they were good enough.

Frank and I drove into Guaymas to see the Inspector de Pesca, but he proved to be out on a extended siesta, which was calculated to last beyond the Cinco de Mayo until Monday. So we left a little pile of literature for the office help to marvel at and picked up some cigarettes, rum, and bread. The day was scorching hot and the streets dusty and without shade so we were glad to return to our bay and shady camp.

After dinner Mac and I hiked up around the end of the Estero San Carlos and got well chewed by mosquitos for our pains. We had hoped to see our porpoise, which is thought to frequent the lagoon, but were not so fortunate.

A couple of gill net sets at Pelican Island netted nothing. Back to my sanctuary and my residual bites. Like I had predicted, the mosquitoes now turned to another victim—this time it was Boots, poor fellow.

May 5, 1956

Out on the snapper grounds at dawn. Frank and I were in one boat and the other three in the other. Frank had some mysterious formula and caught fish one after another. I caught aout 9 fish and the others just moaned about no bites. We came in with 34

snappers, and I suspect Boots had had his fill of advice from my boat on how to catch snappers by the time we decided to leave.

Mac and I went back to the tide pool. Mac saw a big Gulf sheephead swim in just as we arrived. We netted the entrance and tried to drive the fish out. No success. I saw something under a big rock and poked around with the hook. Finally I came up with a big pargo muleto. This time he didn't get away and I ferried him successfully to the skiff. I was swimming out with my fish when a whole school of big diamond sting rays swam around me, scaring the daylights out of me. Back in the pool I found another fish, and this time, with Mac's help, we pulled out the Gulf sheephead, well hooked.

We made a reconnaissance dive across the bay and caught a long-spined spiny puffer (*Diodon holacanthus*) and found some excellent grounds for a new deep water poisoning I wanted to try.

Back at camp we shaved off our whiskers, except for a little lip foliage and headed for town. This was Cinco de Mayo, Mexico's fourth of July. A nice new place has been built along the main road, called the Guaymas Inn. It caters to the American trade and is careful about lettuce and ice and such things as might give the tender gringo tourist's disease. We settled down around a few ron co-leens (rum collins) and had a fine Mexican dinner. We were entertained by a splendid Mexican trio who called themselves the "Trio Bahia". Mac asked them if they had recorded and they said certainly they had. Finally we found that this had been done on a tape-recorder.

In town we wandered around looking for the celebration, but found that the holiday was to be held on Sunday—tomorrow evening. At the far end of town we found the Atayde Circus, complete with cotton candy and extremely low-fi public address system. Being sports for the evening we bought tickets, at 20 cents each, and walked in. We perched on shop worn bleachers up under the tent edge. The band alone was worth the price of a trip to Guaymas. Little White Lies, played on tuba, valve trombone, bass drum, and other nameless instruments. All instruments virtually independent of one another, and all trying to keep in time, not with each other, but with 20 Mexican girl acrobats hanging from the roof. For the most part we had seen the show on TV, but the sea lions were fine. The trainer, billed as Captain Montoya, or something like that, stepped out, resplendent, even for a seal trainer. He walked on his toes and looked like he wore a corset like Juan Peron. His seals couldn't balance things very well, but one big old boy, named Tarzan, screeched and hollered and bellowed with vast enthusiasm through it all and then did a wonderful Charleston. What a sight! It was great seeing that critter flapping his big flippers, in time with one or two of the accompanying instruments.

After a couple of rounds of cerveza at some of Guaymas's seedier cantinas, we drove back to camp, Dick and I taking in the night air in back as we chattered over the washboard.

May 6, 1956

This morning we planned to try a deep water poisoning among the big boulders of a landslide, which had fallen into a nearby cove. The wind, however, was coming from the south, directly into the cove and causing a big swell. Frank thought it was shifting so we decided to wait a while to see if things would calm down. So we hopped into the stake truck and took a little drive up toward the foothills. In a short distance we found ourselves in a sparse short tree forest. I found several caves which had obviously been

occupied by Indians at some time long past. The mouths of the caves were covered with cracked shells of all descriptions and evidence of fire could be seen in the burned earth of the cave floors. We collected a couple of specimens of *Crotaphytus collaris*, the collared lizard. This must be just about as far south as they go. They were the smallest members of the genus I have ever seen.

Back at camp the wind had shifted and we immediately put out into the bay and the collecting grounds. I had Frank and Boots set both gill nets around the area in a semicircle. Mac dropped the poison in. Schools of California sardines were in evidence and we killed thousands of little ones. We have seen other, larger schools. It seems likely that the Gulf harbors a large population of this enigmatic fish, though it has only been reported from this area once before (Walker, 1951?). We collected many fish and caught some nice ones in the gill nets as they tried to rush out of the poisoned area. These included Gulf sheephead and some nice sergeant majors. Frank and Boots had a real job cleaning the sardines from the meshes of both nets. We left about dusk.

Some nice sierra had become emeshed in the net and as these fish are too delicate to transport we relegated them to the ice box, grill and the dinner table. They were delicious but not so good broiled as deep fried. Tomorrow we will gather gear together, do a poisoning for Dick and the UCLA museum, and have everything ready for the morrow, when we leave.

May 7, 1956

Mac and Dick and I left Frank and Boots working on their nets as we left to do the poisoning we had promised Dick. The water of the bay was virtually opaque. The south swell had brought in shoals of plankton and warm water. It was now fine for diving, in contrast to the temperatures we had had in previous days, but we couldn't see anything. Ah well, you can't have your cake and eat it too. Finally, around Punta San Antonio we found a clear cove which had not yet been invaded by the sea of plankton. We dove for 4 ½ hours and produced a nice collection including 48 species. Some were rather rare fish, but these were not of Oceanarium size, as the largest ran to slightly under one inch in length. The poison drifted into a small school of 4-5 inch sardies and stunned them. Their movements on the surface attracted pelicans and gulls in droves. I estimated that 800 pelicans were feeding in our cove. Frigate birds and boobies came too, though only a few.

May 8, 1956

Up at dawn. Immediately we began to roll sleeping bags, pack boxes, and load the little truck. The big canvas came down, leaving the camp looking awfully barren and hot. The load was balanced by Frank to be sure we didn't develop a list. It was an incredible pile of gear, now that the big truck could no longer take things in its big tank. Frank and the rest of us looked more than once, wondering if it was all going to fit.

Next we went down to the beach and awaited Frank and Boots, who rowed out to the live car and pulled the anchor. When it was close inshore we hooked the anchor line to the winch and slowly dragged it ashore with water gushing out of the side ports. Boots stood on top of the truck wearing gloves, Dick stood by the calibration pipe to take the weight of fish. Mac and I hauled the tubs from the beach up to Boots, and Frank dipped from the live car. It seemed like a vast number of fish came from the live car. We

worked fast and smoothly until all the fish were stowed, including the little specimens in their separate bottles. While the rest of us stowed nets and traps and motors and other items in the empty live car, Mac took the initial chemistry on the water. The sun was blazing by this time and we were all covered with perspiration. Mac came down off the truck shaking his head. “the pH is 7.3. I checked it three times. And the oxygen is low. The temperature was also dangerously high.” I said, “Frank, let’s get the little pump rigged. We have to change water, that’s all there is to it.”

We would have lost the load before reaching the U.S. border if we hadn’t done this. I took off my clothes and toted the suction line out into the bay, while Mac backed the truck onto the cobbles. Frank and Boots rigged the pump and soon we had a nice stream of newly fresh water going into the tank. I began to congeal so I got some twine and tied a rock to the end of the hose and also attached a buoy, so it floated in mid water without moving. We reasoned that leaving the water standing over night had caused the changes in its chemistry, which our aerator had not been able to compensate for.

Finally, we were refilled and loaded, with the pH OK and the temperature down. The poor stake truck was really staggering under its load and steered extremely badly. It was past noon and we hadn’t eaten so I suggested we detour and get a bite at the Guaymas Inn before pushing toward home. We tried but the place was closed, so rather than go clear into Guaymas, we turned and headed for Hermosillo. The day had turned scorching and we were glad to see the sun move lower as afternoon came on. We checked our rig repeatedly and changed the filter bag a couple of times before hitting Hermosillo. Our belated breakfast at about 3:30 PM certainly did hit the spot, though we were all surprisingly unstarved because of the heat.

On toward the border as soon as lunch was over. The water temperature had climbed in the tank and we began to fear that our heater was leaking when it was shut off, and this proved to be the case. Exhaust gas was leaking by the flutter valve and slowly raising the water temperature to dangerous levels. The pH began to drop too. We rigged the auxiliary aeration pump and were delighted to see a nearly immediate rise in pH away from the dangerous level to which it had dropped. The temperature stayed up and we began to lose water because of the wind picking up the aeration streams and blowing them over the side. I tried to top off with fresh water but Mexican line pressures in the gas stations we visited prevented us from borrowing more than a few gallons.

At the border at about 10:00 PM, I uttered the magic words “Paragraph 1677” to the Americans (which is the paragraph giving the rules for admitting fish not for human consumption and thus free of duty). The miserable Mexicans, however, wanted to see what was inside all that stuff on the back of the truck. I tried to stop the auxiliary aerator with my foot and got a jim dandy shock through my wet field boot. We all handed in turista permits, except Mac, who was sleeping in the box on top of the cab. About the time we had dispensed with these papers, Mac emerged, yawning. The Mexicans did a small double take but for some reason more or less ignored the incident. I explained we were Cientificos and Biologos and other impressive things. We didn’t have our paper from the Inspector de Pesca in Guaymas, as he never did show up, so I didn’t want to get involved in a discussion of permits. In this vein, I fumbled with all the wrong wrenches I could find, getting the tank open, splashed water on everyone near and put on a grand show hunting for a flashlight for them to see our fish. When I finally got all this done

only one authority was left and he took a two-second look and waved us on. This was fine, and I was even happier to see our snappers swimming strongly.

Across the border, I topped off the tank a little with fresh water and we rigged a canvas to prevent spray from blowing away. We shortly found that this prevented good gas exchange at the aerator and was dropping the pH dangerously again. We cut strategic holes in the cover and up came the pH. I am amazed at how sensitive this factor is to small outside influences.

We took turns in the box on top of the truck (I named it the “hanging gardens” in honor of my sleeping place in the Honolulu Aquarium). It was comfortable and cool, but no place for a claustrophobic.

On through the night after a brief stop at Tucson to have a cup of coffee with Mac’s father. Filter bag changes, water tests, gassing the engines, and riding in back to check the rig, were the order of the night. Frank and Boots labored on in their weaving truck. I tried to convince them to sleep in a motel, but they would have none of it, and later events proved their decision to be our salvation.

It seemed very odd to see the dawn without ever having gone to bed. Dawn found us at Gila Bend. We all wrapped ourselves around a good breakfast, changed the filters and all the rest, and drove off again. I took the Stake for a while and was rather shocked at how hard it was to drive. We got Frank up in the Hanging Gardens but he came out about two minutes later mumbling that he couldn’t go to sleep in that thing. We shovelled Boots into it and drove on. At Yuma the Highway Patrol wanted to make me buy a license for the stake. I looked glum. Finally he said—“When are you coming back to Arizona with that rig?” “Never,” I replied. He rather morosely waved us on.

The temperature began to climb in the tank as the warmth of the day came on us, so at Winterhaven we put 150 lbs. of ice in the tank and brought it down nicely. Frank went, as he calls it, “snooting around” the big truck and found that we had sheared a lug bolt on one wheel. When they were tightened the garage man said we would have lost the wheel in another hour.

At Westmoreland the truck lost virtually all its power and was making a vast racket. Mac and Dick found that the exhaust line had expanded and cracked loose, thus releasing the vital back pressure on the valves. We had this welded again and drove on. At Indio we added 200 lbs. of crushed ice, ran through our usual routine, and shoved off again.

On into the night—drive, check, gas up, change filters, chemistr, drive, and so on. We felt sure we were going to make it by the time we stopped for dinner at Lawndale. What a seedy looking crew we were when we ordered our food! Then Mac couldn’t find the truck key. What a blow! I had visions of sitting there, 20 miles from the Oceanarium, until all the fish died, looking for the keys, but finally Mac conjured them up, and off we went, pulling in the Oceanarium gate about 10:45 PM. We were greeted by brave wives who kissed us in spite of our facial foliage. What a relief to look in the tank and see our fish swiing happily after their long ride! Every one had become a precious cause by this time and such things are not to be let slip away without a fight. But we won, Ma, and were delighted even through our weariness. It was good to see Bill and Phil Schulyer and the whole place. The fish were hoisted to the flume by a benevolent style Coonie, and we left for home and a bath and a little sleep.

September 17, 1956

Seal Trip

At about 5:30 AM we arrived at the *Geronimo* and loaded all the diving gear aboard. Our party consisted of Frank and Boots, myself, George Barlow, Dick Rosenblatt, and Fred Munz. The latter three are graduate students at UCLA and were along to help us collect seals and to capture certain fishes which they needed in their research programs.

The morning was calm and clear after we left the bank of coastal fog. Frank took us around the east end and we inspected the little pocket beaches along the steep southwest face of the island. Not a harbor seal was seen. Their main rookery is located at Ben Weston Point, on the extreme windward point on the island. As we came upon this area we began to see the seals poking their heads up above the water as we passed. They peer curiously for a few moments and then duck back down among the kelp fronds. Ben Weston Point is a rugged rocky area with little pocket beaches of cobbles and gravel interspersed. An almost constant surf beats upon this shore and safe landing spots are few. Probably this is why the seals congregate at this spot. On one beach we saw four or five seals resting like obese sausages on a little berm, just out of the water. They slid into the water before the boat came within 300 yards of them.

George and I were landed from the skiff through the surf. We had two big nets, a seal box and a couple of apples. We took refuge behind a boulder as big as a small house and dried out our clothes. I crept down close to the beach to look over the situation. A big boulder resting close to the beach afforded fine refuge for us. I set up a little blind of some old drift wood, kelp fronds, and cobbles. This was done from behind so as not to disturb any seals that might be in the vicinity. George and I lay behind this watching the surf. Finally, one seal appeared at the water's edge. It looked nervously around and then slid under the water and disappeared. We watched for three hours and saw two more seals, neither of which came all the way out of the water. All the seals suddenly appeared at the edge of the surf, swimming under water for some distance so that they were unobserved. Each scanned the beach carefully along its whole length and then left. We felt that we had been undetected but that the seals were exceedingly wary. They are hunted by fishermen constantly and this probably accounts for their wariness. After three hours the *Geronimo* returned and we boarded her and left for Catalina Harbor. I felt that the seals were so wary in the daytime that we stood little chance until darkness.

At Catalina Harbor we dropped the anchor for the night. The boys went out for a little diving before dinner. When they returned I took the skiff out for a row. We noticed a big boxer on the beach, barking at some goats. He chased a billy, a kid, and a nanny up onto a big rock at the water's edge. The dog took a nip at the billy and got butted for his pains. He chased the kid but it scrambled away up the rock. Then he took after the nanny and backed her into the water. She launched out into the bay like a leaky rowboat and swam away from the barking dog. Before long she developed a port list and I rowed over to her, taking her by the horns, dragging her into the skiff. What a bedraggled critter! She sat in the skiff peering at me out of her big, frightened eyes, while I rowed to the *Geronimo*. A short conference followed in which we decided that since she was a MOTHER and we didn't really want a goat anyway, I would row her back to the beach. She jumped over the stern onto the rocks and stalked away up the hill shaking herself and

trying to retain her full goat-like dignity. We heard a bleat as the little kid found her mother, up on the fog-covered slopes.

September 18, 1956

At 4:00 AM the alarm woke us and we upped anchor for the beach again. As we cruised along, the moon set and the morning became very dark. Frank spotted the beach somehow and Boots rowed George and I ashore, where we landed on a big rock. Both of us had our nets. We crept along as quietly as possible in the dark. The first light of dawn came as we walked up over the rocks in sight of our beach. I could see some vague black objects far down the berm. We walked as close to the water as possible so as to put the animals away from the sea from us. Suddenly we heard a clatter of cobbles and saw two seals lumber off into the water right next to us. I thought all was lost as the others would hear and go too and they were too far away to catch at that moment, but no, they stayed on the beach, unconcerned. A big wave swept ashore and rattled cobbles as it broke. George and I broke into a run under cover of this noise and in a moment were in the midst of the sleeping herd. There were about 15 animals. They came down the beach like express trains. I picked out one and caught him just as he was entering the surf. What a struggle. Once he was in the net he gave me a terrible time. He looked immense. It was all I could do to haul him above the water. I estimate he weighted in at 250 lbs. George had caught another and neither of us could reach the other. I tied mine in the net and finally dragged him up the beach and gave the handle to George. Then I ran off down the strand and signalled to the *Geronimo* for help with my flashlight. The two of us could do nothing but hold on. Soon Fred Munz came ashore and we tried to figure what to do next. We cut the nets loose from the hoops and dragged one struggling beast down the beach to an open spot where Boots came in with the skiff. I waded in, waiting for the time when the waves were lowest, and threw a line to him. He rowed like mad to keep from getting swamped and towed the struggling seal out to the waiting *Geronimo*. The one I had caught was too big to be dragged across the sand (we were afraid of chafing the net though and hardly had the strength anyway as the animal insisted on snapping at us when we got too close to him). Both animals were exceedingly mean and tried their best to bite sections out of each of us.

Boots landed the porpoise stretcher and we rolled the big boy into it and carried him snarling down the beach. He was launched like the other and dragged out to the *Geronimo*. Frank had to use the block and tackle on him.

George and Fred and I lugged our gear down the beach and loaded it and ourselves into the skiff. Back on board we changed into dry clothes and took a look at our new captives. They snapped and growled but seemed in good shape.

Back at Catalina Harbor I spent a little time trying to pry a timber off of an old sunken Chinese Junk. I was of the impression that it was teak but it turned out to be exceedingly mouldy pine.

On around the West End ad down to Emerald Bay, where we anchored. Some porpoise were noted, including a school of adult *Lagenorhynchus*. I didn't want to catch a porpoise at that time as I would have done the UCLA boys out of one of their major reasons for helping us. They wanted to gather observations on some certain fish species. So we left the poropise for the next day, as they were definitely in the area anyway.

Fred is working on the physiology of the retina of fishes and wanted a series of a small goby for his work (*Coryphopterus*), so we gathered the diving gear together and started catching them for him. I tried out the Slurp Gun with tremendous success. This is the gadget which Bill McFarland and I invented for sucking up small fishes. I caught ten fishes in ten slurps. It needs some improvements but even the pilot model works well.

We caught Fred some sheephead and he retreated down the hatch of the *Geronimo* to process them. He has to excise the retinas in the dark and fix them in a special fixative. He emerged about an hour later about 9/10ths seasick from this delicate work and the rolling ship.

By this time we had so much junk on board that we put the three UCLA boys ashore for the night. They had a fine beach to sleep on.

September 19, 1956

Up late this morning—at 6:00 AM, and off to the channel to look for porpoise. About $\frac{3}{4}$ of the way across the channel, after zig-zagging back and forth for two or three hours, we came upon a very large school of Pacific white-sided dolphins. They were spread over perhaps a square mile of water, about seven miles off Pt. Vicente. Many young were seen in the school, including a number which must have weighed no more than 30 lbs. The young were perfect little replicas of the adults except that their colors were a little duller and their dorsal fins were without the characteristic hook of the adult. The little fellows continually leapt playfully from the water like little tunas. One jumped 14 times in succession. Some were glued to the sides of their parents and swam in perfect unison.

Frank missed his first shot because the net jammed. Then he hit a big animal and shortly we were off in the skiff running down the line. Her fellows stayed with her for a while and they swam off as we neared her.

Shortly we unloaded all the plunder of the trip, getting the seals situated in the porpoise training tank and the porpoise in the circular tank. Off to the dock and home.

January 10, 1957

Tursiops Trip

Frank and Boots and I wet to the *Geronimo* at about noon and soon were out of the harbor, heading for San Diego. Our purpose was to make our third attempt for *Tursiops gilli*, the Pacific bottlenose dolphin. We were anxious to perfect methods of capturing this animal as we expect it to be the mainstay in trained sets for the future Sea Arena.

This time we had a modified net on board with which we hoped to circle the creatures and were equipped with a considerable fund of information on the habits of the species.

The weather was threatening and we planned to pull into Newport Bay for shelter, but when we got there the sea was calm so we decided to make a run for it and kept on course. Below Newport the coast is virtually without shelter of any kind so we hoped the weather would hold for the next eight hours. It did as we pulled into the lee of Pt. Loma at about midnight, dropped the hook, and went to sleep.

January 11, 1957

Up at dawn. We ran up the bay toward the Ferry Channel where the porpoises had been seen before. Before we reached it we saw about 15 animals in all, cruising up the bay toward the channel. We saw one old fellow whose dorsal fin had been sliced along its edge and whose body was marked with a broad white line along its dorsal surface. He probably had been scraped by a ship. We followed them all day long, charting their movements. They spent the morning in the bay around the Ferry and then moved leisurely into the Sea Plane Base area. We stood helplessly by as they cavorted among the sea planes. About every five minutes one of these big planes would come roaring down the channel and take to the air, just over our mast. No chance for a set. About 1:30 they started out into the channel leading toward the entrance. The Navy and Marines were engaged in a big series of war games including landings on the Camp Pendleton beaches. This meant that at least one war ship of some description left or entered the harbor every 15 minutes. As our net would be in the water about half an hour at the very least we could not set it in the channel and expect not to get run over by a destroyer or an aircraft carrier.

About 2:00 PM they began making for the entrance to the bay. We hoped they would leave it and go southward along Coronado Strand where there is no traffic and little tidal effect, but no, they played in the tidewater channel and at dusk, to our dismay, moved back into the harbor again. Our last sight of them was as they were lazily breasting the tide going up the bay.

After dinner we took a turn out in the bay and tried to locate the elusive animals by the lights which edge the bay. None was sighted. We tured into Kettenburgh Boat Works and tied up.

January 12, 1957

Up at dawn and up to the Ferry Crossing. Not a porpoise was seen. I figured they might be clear up in the shallow head of the bay and so we cruised up as far as there was water to float the *Geronimo*. No porpoises. Frank said, "I'll bet you they went out of the Bay last night." We turned and cruised toward the entrance. Even though we kept a sharp lookout no porpoise showed its dorsal to us. There at the entrance Frank spotted a fin clear out at the last buoy. The animal was swimming into the bay from Coronado Strand. Soon we found five animals coming into the Bay, breasting a strong outgoing tidal current. There was no chance to work in the harbor because of the current so we decided to take a look down the Coronado Strand to see if there were any more outside.

About two miles south of the Coronado Hotel we spotted a group of five cruising along just outside the surf line. As we came close with the boat their first reaction was to turn toward us, away from the containing line of the surf. Frank saw this and retreated seaward. The porpoises returned to their course. Frank brought us up about 200 ft. outside the animals and abreast of them. He then started creeping closer. They turned toward us again and Frank edged the boat outward. Finally he called out, "Let'er go" and in an instant Boots had cast off the skiff line and I was watching the net fly off the stern as the boat raced ahead parallel with the cruising porpoises. I brought my skiff inside the net so it could be locked when the circle was complete. Frank made the turn about 200 ft. ahead of the school, which had sounded. He then flew around them on the inside, skirting the surf zone too close for my comfort, and I am sure, for his or Boots, though I

had no fear he would do the wrong thing. As he swept around toward me the porpoises rose in a bunch and blew near the head of the net. Boots leapt into the skiff and we locked the net while Frank brought the *Geronimo* close to the net on the far side.

There he reached over with a boat hook and cleared a tangle in the net where the leads had jumped into the big mesh, thus pulling the bottom lead line off the bottom and leaving a clear route of escape for our captives.

“We’ve got them.” Now we had to make them hit the net and tangle in it. Boots and I rowed into the net and slapped the water with our oars, tossed the pike pole at the animals when they rose to blow, threw rocks at them and just plain yelled. No luck. Then we sank the cork line and let the *Geronimo* into the circle. She cruised around like a motorboat, churning the water to a froth, with her fathometer going full blast. The sound emitted by the fathometer apparently is very frightening to porpoises as they run like rabbits when we switch it on at sea. No luck. Frank stood back in exasperation. “we’ll have to purse-seine it, I guess.” This meant that Boots and I took the skiff and began to gather the corks of the cork line into bunches of 30 or 40 and tie them. This had the effect of cutting the circle of the net in half. Still they surfaced, and we saw that we had ten animals instead of the five we had bargained on. “The \$\$\$%# critters still won’t hit the net, I guess we’ll have to umbrella it. This consisted of tying a line on the cork line, running across and tying it on the other side. Then the two were pulled together. This made the net into a figure eight. All ten came up in one section. Then we divided it into a clover leaf. Still they rose. Finally one of the sections collapsed in the tide. Five animals were in the section. One old fellow saw it close over his head. He rushed at the net and rammed his way to freedom. Another, in fact it was the old fellow with the scarred back, burst over the cork line. The other three hit the net right at a bunch of corks. A tremendous thrashing began with net and porpoise flukes flying. Boots and I rushed over in the skiff. I grabbed the littlest captive, which was a baby of about 150 lbs. or so. I tried to pull it into the skiff but the weight of the others made this almost impossible. Boots struggled with another as the *Geronimo* came skirting around the net. As she came alongside our thrashings filled the skiff with sea water and it sank to the gunnels. Boots leapt aboard the *Geronimo* and I swam alongside the tangle of net trying to pull the big beasts into the skiff to get their heads above water. The little fellow seemed already drowned to me. The biggest animal had ripped through the net until only its tail was held. I tried to pull it into the skiff by its flippers. The old girl objected and opened her mouth and clopped it closed about 6 in. from my nose. The sight of all those rows of teeth caused me to switch my efforts to the posterior segments. Meanwhile Frank and Boots had slipped the stretcher overboard and I tried to work it under her. She was so long that she stuck out both ends a long distance. One lunge and she had broken the spreader board into splinters, scraping the broken wood over one of her eyes.

Frank and Boots began bringing the mass of net and porpoises up on the boom as I climbed aboard to help them. Then the boom snapped. The hook at the mast had broken loose under the extreme strain. We had no choice but to continue hoisting with the boom and hope that it wouldn’t collapse on our backs. Creaking and straining, the animals came on board. We cut the old girl loose from the net and she flopped onto the deck. What a monster. She was 10 ft. 1 in. long and we think she must weigh about 800 to 1,000 lbs. Another porpoise about 500 lbs. in weight was in the net and then the little animal. These two had drowned in spite of our best efforts to save them.

We turned around to find that the remaining five animals were still surfacing in another segment of the net. Afternoon was on us and the wind was picking up. We were disturbingly close to the rising surf. Discretion is the better part of valor so we decided to haul in all the net we could gather so that we could make a quick getaway if we had to. We did this and the animals continued to rise in the remaining net. Finally, as we were about to try to drive them into the mesh, they spotted the opening in the net between the two wings where they were being pulled aboard the ship. Out they went, and joined their old friend "Scarback" who had been waiting for them all the time we had been working on our captives. We had set the net at 11:00 AM and it was 3:30 PM when we finished.

As we had not yet had time for breakfast, I started peeling potatoes and before long had a tasty snack of fried potatoes and onions, bacon and three fried eggs a piece. As for myself, I was hungry and scarfed the food practically without tasting it.

We called Marineland while we were still working on the animals in the net and once in port made preparations to unload the big animal. The truck arrived at about 8:00 PM and we struggled with the huge beast. The tail loader of the truck refused to function so we had to hoist the animal by hand onto the truck bed. We never would have made it if we hadn't commandeered the help of about 10 teenagers who were stading around watching us.

The truck left and Frank decided that the weather and the low fuel tanks of the *Geronimo* made it sensible for us to stay in port and try to run for San Pedro the next day. Off to the welcome sack.

January 13, 1957

The threatening skies made us uncertain that we would be able to venture out of San Diego Bay, but we fueled and listened to weather information and decided to run for it. We expected the seas to be rough but we found nothing but a gentle swell all the way and made fine time under a cloudy moonlit sky. On the way up Frank and Boots and I hashed over the operation a dozen times and decided on new ways of beating some of our problems, particularly those of hoisting the animals aboard once they had become tangled in the net.

I feel that our mission was accomplished with much better success than we could have expected. We can now go out any time of year and have reasonable assurance of making a capture. The net worked perfectly and the animals behaved in a manner that makes them simple to trap in the net. Our discovery of their habit of leaving the harbor to swim along the Coronado Strand allows us to work on them in a calm area with little or no traffic to bother us. We will never try for them in San Diego Bay again. We have reports that they congregate around the garbage dumping grounds off Imperial Beach, a few miles south of the place where we circled our animals. If this proves to be the case, and it sounds logical, we may be able to cruise directly to the animals at any time. I feel that there is now no earthly reason for us to consider further the idea of shipping porpoises by air from Florida.

February 2, 1957

*Field Notes on trips taken for the capture of a pilot whale, Globicephala
scammoni*

For more than a year we had been talking about the possible capture of a pilot whale for Marineland. As the animals were of a small enough size that capture seemed feasible we had begun actual preparations in December of 1956. We knew that the whales congregate in certain localities when squid are spawning and that their presence is predictable with great certainty. After many a session talking about the best method of capture and handling we decided to attempt to get close to the whales by use of the porpoise pulpit or from a skiff towed by the *Geronimo*. We decided on a rubber life raft to transport the animals to Marineland. Our plan was to exhaust the whale until it could be handled alongside the *Geronimo*, slide the raft under the beast, inflate the raft and drydock the whale. Then we would bail the raft dry, or use our portable, gasoline-driven pump for the purpose. Then we would tow the animal to the pier and slide raft and all on a heavy plank platform. This would then be hoisted onto the waiting truck and taken to the holding tank,

Tony Arnoe had obtained the raft for us through Goodyear Rubber Company. The raft measured about 13 ft. in inside length and was calculated to hold 20 men. Frank and Boots spent many hours rigging lines and net protectors on the raft. We had lines for towing, lines for securing the whale in place, extra bridles in case the raft would have to be towed backwards, emergency releases for the CO₂ bottles, and so on. The platform was built of 2x12's, carefully bolted together and sanded and oiled to prevent any damage to the raft. Bill Monahan made sure that "Marineland of the Pacific" was painted on our equipment in enough places that it would be hard to take a photograph without the viewer knowing about us. Everybody was briefed on photography techniques and enough film and cameras to support Eastman Kodak for at least a couple of months were loaded on the *Geronimo*. On board, Frank and Boots had rigged heavy 24 thread lines and special capture snares and nets.

Frank and Boots, Don Hackett, Charlie DeSoria of "The Sea" television show and myself left the dock at 7:00 AM. Our first problem was to bring an animal on board for measurements so that our nets could be built of the proper mesh and so that we could examine various anatomical features such as flipper placement, size of the head, and anything else that would tell us how the animal could be caught alive. Frank brought along his deer rifle and planned to shoot an animal, cut quickly over to it so Boots could harpoon it before it sank and was lost. This procedure sounds cruel and was not pleasant for any of us, but we could rationalize our way out by remembering the works of whalers past and present, and the fact that the animal would die instantly from a shot in the head. This same procedure had been followed prior to our first porpoise capture and had proven its value there.

We made our way toward Catalina Island and met with a large diffuse school of pilot whales off Emerald Bay. In spite of our best efforts we were unable to obtain an animal. The big beasts sounded before we could get very close to them. We left this school and went around the west end of the island. Off Ribbon Rock we met with another group. Frank shot one and it was killed instantly and slid in the water toward the *Geronimo*. Boots stood poised in the pulpit for a shot with the harpoon. Just before the animal came close enough, another larger animal raced over, reared partly out of the water and fell over the blowhole of the stricken beast. This caused the dead animal to sink and disappear a second or so before Boots could drive the harpoon home. We watched the school dive in search of their member. We were in 1,200 ft. of water and the

whales apparently were diving very deeply, though I cannot guess if they were reaching the bottom. One long dive by the group lasted 4 minutes and 50 seconds. After about 40 minutes they dispersed and began to swim up along the coast again.

The squids were spawning in uncountable numbers off Ben Weston Point and dolphins and pilot whales were lazing in the water feeding on them, while dense swirling flocks of birds were everywhere. We were unable to get another animal and had to settle for observations on their schooling behavior. We could make out three major kinds of schooling activity in the pilot whale groups. Feeding animals moved very rapidly and more or less randomly with the animals paying little attention to one another. Travelling schools very often moved as a single front with the animals swimming adjacent to each other. It was possible to harry these schools long enough so that one could get fairly close to them or cause them to stop and backtrack, but as soon as they were left unmolested for a while they would move off again in the same direction as before. In some cases, where the animals were swimming fairly fast (4-5 knots), it seemed almost impossible to disturb the formation, other than to cause the nearest animals to sound. The third group, and the one which looked most promising to us, was the lolling group where a dozen or more animals could be seen lying at the surface, playing and rolling in the water or resting with the tops of their heads and dorsal fins out of water. These groups could be approached quite closely before they would sound.

We anchored in Catalina Harbor and enjoyed a good meal and a night's rest. Because of the shortage of bunks I put my sleeping bag out on the galley floor.

February 3, 1957

Another day spent without obtaining an animal and without getting very close to them. We cruised around the island in an attempt to find the beasts in the calm water of the lee but failed. We anchored in Emerald Bay.

February 4, 1957

Charlie DeSoria had to get back to the mainland so we worked a little in the morning and shot across the channel toward the Palos Verdes Peninsula and down over Dago Bank and Huntington Flats without seeing any animals.

February 5, 1957

Back out to sea, with Frank and Boots, Don Hackett, and myself. We went directly to the west end of Catalina Island and about a mile offshore from Ribbon Rock we came upon a large school of pilot whales. After working with them for a few hours we finally hit a fairly small animal and Boots was able to harpoon it. We brought it alongside and were interested to note a member of the school swimming close to the boat following the dead animal. The larger beast did not come close enough to be netted, however. We hoisted our prey onto the deck and began examining it closely. It was a young male 9½ ft. long. Our measurements showed that our guesses on the size of mesh in the net were fairly good and that we could expect our net to be successful on a larger animal. In Catalina Harbor I worked the animal over carefully. It was marked with a whitish patch between the pectoral flippers. It had a few hair follicles on its lips as is the case with other species of whales, particularly foetal whales. We had killed the animal instantly with two simultaneous shots through the brain case. In its stomach were the

beaks and lenses of quantities of squid. The creature looked much like a great overgrown tadpole with a long grotesque tail.

February 6, 1957

We spent this day trying to maneuver onto the whales with the *Geronimo* and trying to get close from the skiff. We tied a steering oar to the stern of the skiff. I took the oar while Boots attempted to wield our big heavy net. Twelve hundred feet ahead, Frank maneuvered the *Geronimo* around and among the schools of pilot whales (I estimate that there were 500 in the area).

Don tended our line and took pictures of it all. With great skill Frank put our little skiff close to the whales as we both moved along. Boots swung the great cumbersome net around in an attempt to hit the whales as they surfaced near the skiff. I worked the skiff closer with the oar and tried to keep out of entanglement in the swinging net. Twice the whales surfaced within five or six feet of the skiff and Boots lunged at them with the gear. On the first try the apparatus broke and we had to improvise a makeshift splice as we bobbed and slapped along. The second shot slid off the head of the startled whale, which reared up in its fright and throwing its tail free of the water, sounded in an instant.

Frank took our places in the skiff, which was a welcome relief for us, considering the damp blowing fog which surrounded us. Frank got one rather poor shot and had the animal slip out of the collapsing net. As he was mending the net another whale actually swam up behind the skiff and bumped it with its snout. From the *Geronimo* we could see, and almost hear, violent gestures of helpless fury from Frank.

It was obvious that we were too close to the water in the skiff and that our net was not properly designed for the job we were asking of it. So we turned for home. As we rounded the west end of Catalina Island we came upon a small school of pilot whales. Among them was one that seemed to have a large white blotch on its snout. Our first fleeting thought was that it was a killer whale. Soon we were able to make out that it was an adult pilot whale carrying a partially decomposed foetal baby on its snout. We watched the animal for half an hour and could see the little snout and flippers of the dead baby. It was so decomposed that when it was left briefly floating on the surface, the wavelets passed right through it. Its skin had been eroded away and the creature was almost entirely white as a result of the exposure of its underlying blubber. The nose of the adult had been worn until it too was white. Who knows how long this whale had been carrying the little dead animal? It carried the flaccid body down on each dive, bringing it again to the surface.

Frank launched out into the skiff and we were all delighted to see the whales swim directly toward him, their globose heads plowing through the water as they came. We saw Frank strike with all his might. A huge tail and flukes swept out of the water well above Frank's head, crashing spray over the skiff. The animal sounded and was gone. We learned in a few moments that Frank had "scooped" the whale and at the crucial instant the net had collapsed. The whale, presumably a big adult male, had flipped in a tight circle and had actually swum out of the net without touching it.

On the way back we talked over what we had seen and what should come next. Frank and I decided that we should use the skiff, at least a little longer, as it would be easy to rig in the proper manner. If it failed we agreed that we should try a swordfish plank. We would build a net that wouldn't break and that could be handled for quick

shots. Frank devised a platform with a little enclosure which could be mounted on the skiff and in which one could stand.

February 13, 1957

Back we went to sea again. Frank, Boots, Don, Fred Lowe, and I all felt that success was within our grasp. After all, on the last trip we had hit the animals at least five times and had had one run into the skiff. Our gear was in good order and would give us a much better chance than before. About four miles out of port we came upon three California gray whales cruising in the flat, calm water. One 35-foot animal circled the *Geronimo* completely. We could see the beast as it swam on its back under water about five ft. below the surface.

The waters were full of porpoise: Dall's, striped dolphins, and common dolphins. At one point we were accompanied by two striped dolphins who swam in front of the bow for 20 minutes without a break. I had an extraordinary opportunity to observe them. The sea was so calm that every detail could be seen on the animals. In fact I was able to tell the sex of the animals. Both were females. They ran the bow for long periods of time without any movement of their tails. In fact one of them cruised for 47 seconds without a single stroke of her tail. There is now no doubt in my mind that these little cetaceans ride the bows of vessels to hitch a free ride.

Though we looked carefully we could not find a pilot whale until we finally came upon a school travelling up toward Santa Barbara Island. It was moving rapidly and in spite of all our efforts we could not get close to any animal. We harried the school for a long time with utterly no success. We finally left the school and failed to find any more animals. We anchored in Catalina Harbor and contemplated our troubles, trying to figure out why we should be able to approach the animals one time and not the next. No answer.

February 14, 1957

In the early morning hours I heard the wind blowing across the harbor and when we got up we could see a fairly heavy swell running outside. We regretted the disappearance of our beautiful calm weather as our methods were certainly not geared to high seas. All day we worked the skiff among schools of whales, off Ben Weston Point. Many times we approached within 20 ft. of the resting animals but each time the slapping skiff bottom on the waves gave us away and the whales sounded. In these resting groups we saw the creatures do several amazing things. Curious individuals would raise their heads out of water bolt upright, turn their heads, and look at us. They looked for all the world like big brown stumps. The Italian fishermen call the pilot whales "Monico" of monk. The name is certainly fitting in view of this peculiar habit.

The we saw them do just the opposite. Sometimes a whale would point his head directly downward into the water, throwing his tail out into the air. I timed one big old fellow who stayed in this grotesque position with about five ft. of his tail and flukes out of water, for 40 seconds. Many times we watched them swimming on their backs and lolling with their flukes and flippers out of water. One pair was noted mating.

The noises emitted by these interesting little whales were of several kinds. We have heard them whistle a high-pitched whistle that was almost out of the audible range.

Sometimes they chirped much like a baby chicken chirps. We heard one emit a wail like a low pitched siren. The most common sound was a series of repeated popping noises.

From time to time we saw whales breaching—that is leaping completely free of the water. They made a sufficient splash to half empty an oceanarium, when they fell back again.

Coming so close but not close enough became very frustrating after a day's watchful waiting in the cold fog on the bouncing skiff. We finally returned to the *Geronimo* and had a cup of hot coffee and talked it over. Our conclusion was that we would have to seek calmer waters before we could hope to succeed so we set out for the lee of the island and the hope of finding our animals there in calm water.

Although we kept a careful lookout, not a pilot whale was seen. We anchored in Emerald Bay and talked things over. We hashed over every angle and finally decided that we would have little chance of success except for an occasional occurrence, with the skiff, unless it was glassy calm. Glassy calm days are few and far between. The solution was to try for plank shots with a swordfish plank attached to the bow. Next morning we crossed the channel and saw no more pilot whales.

February 25-27, 1957

Frank and Boots had painstakingly mounted the swordfish plank on the bow of the *Geronimo*. It was 26 ft. long (the *Geronimo* is 37 ft. overall) and supported by over 300 ft. of judiciously placed cable. Two thin cables ran along it as guides so that a person could thread his way out to the end as it bucked along. Every movement of the *Geronimo* was magnified several times at the end of the plank so that even a moderate sea caused it to cut up and down 20 ft. or so with each plane of the ship. Although the storm flags were not up, the big swells were crashing over the breakwater as we left port and skies were leaden with low clouds. The sea was at its worst for any of the trips taken during the whale venture. Through it all Mac, who had taken Don Hakett's place, was certain we were going to catch a whale. After all, he said, he was aboard. We made our way toward the west end of Catalina Island in hopes of picking up our resident herds. Not an animal was to be found. We proceeded on down the coast to our old stamping grounds off Ben Weston Point. No whales. We rounded the east end and pulled into Avalon Harbor for the night. The squid had gone and the whales with them. What a feeling. The only moment of the day worth recording was when Mac ventured out onto the plank and dropped his wallet in the water. It was churned under by the *Geronimo*. As we were commiserating with him Boots sighted it off in the water and we retrieved it, not even wet on the inside.

An old fisherman named Pete rowed over alongside of us in the harbor and as he sat and sculled in his little rowboat we learned all the news of Avalon—who had bought the market, what the local poachers were doing, what Fish & Game was doing to the local poachers, and so on. Frank cooked up a stew out of what we claimed was moose meat and we went ashore to take in the off-season sights of Avalon. The big moment came as we were resting on a bench along the waterfront when the local cop almost got into a fist fight with the county sheriff. We sat 20 ft. away as their words became more and more impassioned. They were arguing whether the sheriff should be allowed to park where the local citizens should not. Just before the climax arrived the sheriff raced off in his jeep in a cloud of dust.

We talked to one of the local fishermen, George Voyovitch, who rides the crest road of the island in a jeep every day and can often see the whales. He had seen none after the storm which just preceded us.

Back at the *Geronimo* we decided next morning to go back around the east end and cut out to sea in an attempt to find the animals if they were farther out offshore.

February 26, 1957

It was a glowering foggy day as we pulled out of the harbor. Once we passed out of the lee we came into a big swell that dipped the plank into the water from time to time. We cut back in toward the unseen island after a fruitless search in the rough, foggy waters. At the west end I asked to run toward Santa Barbara Island, in hopes that the whales might be found there. About three miles out we ran into a school of pilot whales travelling rather rapidly. Both Frank and Boots took turns in the pulpit. The big swell sometimes dipped them in the water up to their waists and then rocketed them 30 ft. above the surface.

Every swell brought a sickening drop like that one experiences on a roller coaster. The net flew and more often than not the pulpit stopped abruptly inches from the surface. In this rough sea we had practically no chance at the whales though we did get over them enough to raise our hopes that the plank would work in better weather.

I hoped we would find the whales in the lee of Santa Barbara Island, so we kept our course. As we neared the island the big swells humped up over the shallow shelf that surrounds the island, making conditions worse and worse. We finally turned and went back down the channel toward Santa Catalina Island again. I went out on the pulpit in the relative calm of running with the sea. Mac and Fred did their best to get Boots to turn me into the sea so I would get dunked but Boots, bless him, refused to do it. Anyway, I stayed dry.

We kept our lookout for hours without seeing anything except a few Dall's porpoise and a school of common dolphins. I put in a call to Bill Monahan as we cruised off Avalon in the calm lee waters. "We would be in tomorrow." The plank looked good but the weather had prevented us from using it." About 10 minutes after this conversation Boots spotted a group of pilot whales lazily cruising along. We closed on them and Frank climbed out into the pulpit. Several times we had chances that didn't quite succeed. Finally a huge old male came up under the pulpit. His great black back seemed to well up under the plank. Frank hit him, and believe it or not, the whale's head was so large that Frank couldn't slip the gear over it. From our later experiences we would probably still be fighting him if Frank had succeeded in snaring him. The air was filled with Frank's own particular brand of language and gestures. Frank hit another which took out the line but shook free. We kept trying. I asked Frank to come off the plank for a breather and to steer the boat while Boots worked the plank. Frank asked me if I wanted to go back to port as it was getting dark. I said "No, let's work until dark and see what they do."

Frank would have scalped me if I had said, "Yes, let's go back to port." As it got darker, suddenly it became much easier to cruise over the animals. Boots let fly on one and bounced the gear off its head. A few moments later with great skill Frank put the pulpit over another animal. Boots struck again and this time the net came free and the line began to fly over the side of the *Geronimo*. We did not know how well snared the

animal was so Frank eased the line out carefully, always keeping it taut. We were afraid the animal would turn on its back and shake the snare. Every time the boat came abreast of the line we had to slack off. The first dive of the animal took out about 600 ft. of line. The beast did not go straight down but out at an angle so it is doubtful if she was down more than 400 ft. She stayed submerged for four minutes before coming up with some of her friends alongside.

The light was gone so Fred Lowe just stood by in helpless photographic frustration. Damned inconvenient of us to catch our whale in the dark. Frank snubbed the line and tried to put a strain on the beast by letting the line out slowly. Finally the line went slack. We all feared that the whale had escaped but Mac up on the pulpit could hear blows out ahead. We pulled the line in. Freddy dropped his cameras and started flaking line down as it came in. Before too long it became apparent that the whale was still there and that she was just lying in the water so that she would not exhaust herself pulling the heavy line. When she came close enough to the boat for us to make her out she went down and began taking line over the side at a considerable clip. We had attempted to keep the ship going in the same direction she moved but this time she crossed us and before we could change our course (we had to be very careful not to get the line caught in the screw) she had taken out all but 20 ft. of line. If she took it all she would come up abruptly against the weight of the *Geronimo* and we would have had to test the strength of the snare or the line, whichever proved to be the weakest link. But we stopped her.

Six other whales were travelling with her, making rocket trails in the phosphorescent water, usually swimming just ahead of her. They took us out into the channel and were heading us out of the lee of the island into the rough San Clemente Channel. Nothing we did would seem to change their direction.

I tried to call on the radio but was frustrated by a maddening series of calls from Navy boys calling their girlfriends. We couldn't get a call through until 11:30. Meanwhile the whale just kept swimming with remarkable endurance. Frank developed a method of snubbing the line so that he could regulate the strain on the plunging beast. He kept a heavy tension on her at all times so that she would wear down. Finally she slowed enough so that we heaved her into view. One time we put a spotlight on her as Fred snapped a picture. This frightened her and she sounded briefly, only to be hauled by brute force back to the surface.

We could see that, in addition to her company of pilot whales, she had a retinue of Pacific striped dolphins as well. Another hour and we decided to try to bring her alongside. Mac tried to slip a noose around her tail but did not succeed until several attempts had been made. As she came alongside the *Geronimo* her whale friends left and only the little dolphins remained. Boots and I jumped in the skiff and took the life raft on board. While I tried to keep the skiff from getting caught under the rising and falling rail of the *Geronimo*, Boots tried to slip the raft under the whale as she lay thrashing and blowing. Finally, with an acrobatic maneuver where I pushed the boat off, reached over to the raft and Boots pushed with an oar while the others pulled lines behind the beast, we managed to slip it under the captive. Frank worked the whale in among the maze of lines so that it would not become fouled and gave the command to inflate the bottles. Boots pulled one and I pulled the other and in seconds the whale was drydocked in the high riding raft with only a moderate amount of water around her. Boots jumped in the raft and

began bailing, so her blowhole would be above water. Frank and Mac and I lashed her in place while Freddy sealed rigging and ladders to get his photographs. The whale proved to be in excellent shape and breathed very satisfactorily. She had been very securely netted. The raft was a superb resting place for the animal as it was cushioned by water at all points.

Then as we were about to begin the trip home I came within an ace of falling ingloriously over the stern of the skiff in my excitement. Everybody was exultant. We, by golly, had caught a real, live whale, and were about to bring it in! We didn't think many people had done that before us. We celebrated with a cup of hot coffee. The chase had ended 10 ½ miles out from Avalon, or well on our way home.

As usual I had gotten soaking wet and went below to get into dry clothes while the others secured the raft and headed for Marineland. Frank took the *Geronimo* in close to the Breakwater at San Pedro, in case we should encounter bad weather and have to duck for shelter. The weather was the best we had had on the trip and so we headed on up to Marineland, inspecting our charge once every 15 minutes. Off Marineland at 4:00 AM we tied to a buoy and waited for dawn. By 7:00 AM the beach was lined with cars. The loading platform came down, we slid the raft and whale in it and up she went, as simple as that, onto the waiting truck. Then the whale went up the hill to her holding tank and into the waiting arms of the public relations department.

January 22, 1958

San Felipe Tursiops Trip

Off at 3:00 AM for San Felipe and an attempt at capturing the tonina (*Tursiops gilli*). Frank and Boots and I travelled in our big truck and two photographers, Lee Green and Cy Johnson, drove down in their pick-up. We met at the border. Our attempt to cross on the strength of our permit failed and Boots and I had to purchase Tourista Visas. Frank stood out of the way and didn't buy one—which fact was never detected by the Mexicans. Thus Frank had the pleasure of bilking the Mexicans out of three dollars.

The office of Aduana (customs) was lined with braceros awaiting their papers for crossing. Our man preempted the only typewriter in the office, leaving the braceros waiting while he recorded such deathless information as our job description (both biologists) and the color of our eyes. Finally we finished and gave the typewriter back to the bracero clerk and were on our way. A little lonche in Mexicali and we were on our way down the long desert road to San Felipe. There we found the St. Francis unoccupied as always, and roofless as always. We obtained its dubious rental for a dollar per day from the new proprietor, Carlos Duenas. We learned that the old proprietor had lost it in a poker game. We moved into the empty freeze box for the first time. This is a 12x8 cavern whose door hangs limply from one hinge. Gear was unloaded and we began preparations for the next day. I laid out my sleeping bag in the open air in the main salon of the St. Francis since I didn't like the idea of being cooped up in the confines of the box. This proved a sage maneuver as the night's music could be heard for blocks. Lee took bass and a resonant one it was. Boots supplied the piccolo. Frank and Cy formed the sax section while I slept in quiet cold isolation as a blustering cold wind swept over the beach and the roofless St. Francis.

January 23, 1958

San Felipe

Up early. Frank and Lee and Cy went into town to check with the Cooperativa about a boat. Boots and I decided to take a hike up onto Punta San Felipe to look over the sea for toninas. We walked around the point over the rocky flats and up onto a steep spur of the point. The wind blew so hard that I had to climb down a little from the edge of the ridge to keep my balance. The Gulf was covered in white caps. We could look far out across the Gulf in all directions but could see no toninas.

Back at camp we found that Frank had arranged for a boat the following day, weather permitting. We rounded up gear and got ready for our 8:00 AM start the next day. The two cameramen had an incredible pile of cameras, batteries, tripods, and unidentified but heavy gadgets. We who had to do nothing but catch the porpoise had the lesser pile.

In the afternoon I drove up to a little pocket beach north of town and walked up and down it looking for porpoise skulls. I didn't find any but had a good walk out of it.

The Cooperative Boys were in the midst of a three-day shrimp trip but would take us along while they fished. Actually, they obliquely stated that they would be at our service but for the record would complete their cruise as planned. They assured us that the porpoise came in droves as the drag net was hauled aboard. They then waited around the boat for the trash fish to be throw overboard.

Frank bought two dollars worth of shrimp (about 4 ½ lbs.) and we had a sort of shrimp macarone with tomato sauce plus a huge pile of fried shrimp as a side dish. It was superb and everybody emerged stuffed to the scuppers. After dinner our photoraphers amused us with tales of their many travels around the world.

January 24, 1958

San Felipe

Two trips with the skiffs sufficed to get all our gear on board the Cooperativea boat, *San Fermin*. The *San Fermin* had come originally from San Pedro, having been built somewhere around 1920. She was a mess of frayed wood, tattered lines, and rusty gear. Somehow or other she still stayed afloat. Frank thought that one rough day in San Pedro weather would have done her in. In the calm waters of the Gulf the Mexicans are able to stretch out the lives of their boats without the grace of paint or repair. The *San Fermin* was the last opeative boat the Cooperative has. The other two, the *San Luis* and the *Felipe Angela* lie sun-baked and cracked open in the estero in the middle of downtown San Felipe.

The *San Fermin* turned toward Punta Estrella and soon dropped her shear boards. The net was streamed off the stern and disappeared into the murky water. The silt and mud from the Colorado River keep the upper Gulf constantly brownish with a visibility of at most three ft.

We dragged the net for a couple of hours before some porpoises hove into sight, leaping along. Our hope was to get close enough to them in our skiff to drop the grabber over them. All sorts of combinations were tried but never would the animal surface near the waiting collector.

After this experimentation we crossed San Felipe Bay and set the drag down again north of Punta San Felipe. Once again an hour passed before the porpoises came

again. The *San Fermin* was stopped and the trash fish scooped over the rail. Gulls and pelicans filled the air, arguing frantically with one another over the little fish which floated among them.

The porpoises came in under water. Occasionally we could see them through the murk as they picked up the sinking fish. Many times they blew under water, causing big boils of bubbles to well to the surface. Ever could we get close enough for a shot.

Fortunato Valencia, the skipper, told me somethig of the little harbor porpoise of the Gulf. He said that it was commonly called “vaquita” and that “cocinita” referred to a species which came in great schools to the bow, probably *Delphinus*. He said the vaquita was about four ft. long when adult. The dorsal fin was shaped just like that of the tonina he said. As for color, it was a uniform lead gray which became white on the ventral surfaces. He said there was no black line from eye to mouth as is found in the harbor porpoise of San Francisco Bay and northward.

Fortunato is an observant and sagacious old Yaqui Indian whose word and memory one has a tendency to trust. He told stories of catching the little porpoise in the estero north of San Felipe (15 miles). He stretched his totoava nets across the entrance and snared three of the little animals as the tide dropped. He also mentioned taking one in a drag net while fishing for shrimp. The portion of the gulf near the mouth of the Rio Colorado was the grounds where they often saw the little babies of the vaquita in May and June. The young were described as being two ft. or somewhat less in length.

He mentioned the story of a fisherman who was working near a small estero at Aqua Charlie, near Punta Estrella, south of San Felipe, who came across a mother and her baby stranded by the dropping tide. The gulls had picked one eye from the baby but when both were lifted over the bar they swam rapidly off into the depths. Another fisherman told us that the vaquita was commonly thought to be a “duende”. The translation of this word is loosely something like “a creature inhabited by a supernatural spirit”. This fisherman thought such notions came from the porpoise being so wary that it puffed to the surface once or twice and disappeared from view. All this was most interesting to me as we were speaking about an animal which was completely unknown to science.

We went ashore with all our gear to plot the next day’s operation.

January 25, 1958

San Felipe

This morning we got up before dawn and loaded the skiffs for a try at netting the porpoises with the big net. The air was calm but very near to freezing as we pushed out into the dark. We took a box of food for the Mexican cook, Olayo. Olayo stood adamant against the customs of the norteamericanos and refused to wear shoes even though the weather was cold enough for fur boots. His “Florscheims” as Boots called them, was a tough, brown and horny hide that covered his splayed, almost prehensile toes.

We dropped the trawl overboard and after a decent interval the toninas showed up, waiting for the expected meal. While they gathered around the boat as the catch was dumped on deck, Frank and Boots and I tried to circle them with the net from our two skiffs. Before the net was half out someone gave the alarm and they appeared lazily puffing along outside the cork line. The water was so murky that one couldn’t see three ft. yet they had sensed it and left the danger area.

At lunch Olayo brought out a meal of ham, eggs, potatoes, tortillas, beans, and salad. Lee Green, usually a cavernous eater, sat picking at his food, mumbling something about weighing too much and diets and all. He ate just a couple of tortillas filled with beans. We all noticed this and wondered if he was getting sick. After the meal was over he made it all clear when he told us that he had been peering expectantly into the galley when he spied Olayo trying to cut the tinned ham we had brought along. The galley is a peculiar affair where there is only room for one man, and he has to perch over an open channel that leads directly below into the engine room. This space allows the cook to yank the lanyard for the starting motor of the diesel engine. Anyway, Olayo couldn't keep the ham from sliding while he was cutting it so he used the simple effective expedient of grabbing it with his prehensile toes and soon he was slicing off sections with facility. The sight of this little brown man standing on lunch was too much for Lee, but he claims he didn't tell us as he didn't want to spoil our meal!! The inexorable conclusion is that Lee realized that his problems were all in his mind and that Mexican bacteria were not really involved.

The next try with the net was a beautiful attempt. The porpoises were lured to the bow by a man throwing fish to them. The net had been piled on the stern of the big boat and was now streamed into the water. The circle was only about 2/3 complete when the porpoises took fright and disappeared under the boat to come up, puffing on the other side.

At dark we left the boat and made for shore again. We decided that our next moves would have to be at night as the toninas were reported to be much less wary in the dark and to take bait readily. Fortunato reported that they ran the bow and would surface to blow. The photographers could not work in the darkness so they packed their gear and started homeward. They had been an interesting pair and well accustomed to the rigors of field work so that they were easy company to have along.

January 26, 1958
San Felipe

Frank wanted to get some of his gear ready for the night and we had decided to go equipped with the Indian Salmon Hook apparatus, so that had to be built. While Frank and Boots labored over their gear I took a long hike down the beach toward Punta Estrella. I wanted to see if I could pick up any skulls of the little vaquita. I found a few fragments including one skull in bad condition. On the way back I hopped over the beach dunes to the playa surface behind where hiking was easier than on the soft sand. I got my first view of a peculiar parasitic plant that the Indians used to use for food. They called it "sand food". It is a strange fleshy plant with a large thick watery stem, and a crown of little star-shaped purple flowers. The roots led directly to the roots of two nearby creosote bushes.

After a time I came upon the only giant cardon cactus I have ever seen in the vicinity of San Felipe. It must be one of the most northern plants of its kind. It is a battered old patriarch growing partially out of the dune mass.

At about 1:00 PM I walked out onto what is laughingly called the "Aeropuerto de San Felipe" and there met Frank and Boots who were waiting in the truck. My hike had covered about 14 miles and I was bushed a bit. It was good to ride the rest of the way.

At 4:00 PM we boarded the *San Fermin* and set our net off Punta Estrella. After dark we brought it up and had a big load of bait on deck as a result. Some very interesting fish were in the pile. There were wolf fish—very long silvery critters (*Trichiurus ites*) which the Mexicans called “liston”. There were the fuy little batfish that crawl on their fins over the bottom and which have a fishing lure on their nose (called “cameleon”).

At dark the weather began to turn bitterly cold. The sea remained as flat as a millpond however which proved to be a blessing later on in the night when we came to personal grips with a tonina. There was no place to retreat as the wheel house only held three people and two of the Mexicans were always sleeping and the galley only held Olayo and his Florscheims. So we stayed outside and froze.

Frank tried the bow with the grabber but the porpoise still refused to surface anywhere near him. It was very frustrating to see the big beasts a couple of feet beneath the surface, riding along steady as a rock. In fact Frank could stand it no longer once and took a shot which missed by just a couple of inches.

The skipper stopped the boat before we could get another shot and one of the deck hands, Rafael, began to throw bait over the side. We were literally engulfed in a cloud of gulls and pelicans, even though it was pitch-black night. The toninas came in under water and could be seen picking off the bait beneath the surface. They gave us no chance to use the grabber. Manuel, the head of the Cooperativa, had been rigging a line with a big totoaba hook. He picked out a small corvina and put it on the hook. After a few moments he got a mighty strike and the thin nylon began to whistle through his hands. The line was so small he couldn't get a grip. We jumped into the skiff just in time to see the last of the line streak over the side and disappear. Manuel was burned painfully across his fingers for his effort.

A more sensible rig of manila line was rigged and in a few moments we got another strike and the line began leaping from its basket into the murk. Boots and I jumped into the light skiff. Frank and the two deckhands jumped into the other. Just as we cast loose Manuel leaped into our boat with the line which we made fast under the bow. It was 2:00 AM and the case was on. The porpoise took us off at breakneck speed away from the *San Fermin* while Frank and his boys tried to get close enough with their skiff to put the grabber over the animal. No luck.

Finally Frank and his boys got close enough to us to try to tie up to our skiff. They were puffing and panting. Frank had been cussing us so thoroughly for not turning the porpoise (which we couldn't do) that he had actually run out of breath and all that was left were soundless gestures.

The porpoise pulled us on and on. Finally, Manuel who had hooked the porpoise and who thus considered himself in charge of this particular animal, untied the line to Frank's boat and asked to have the motor turned on. Frank let out a bellow including a variety of unkind words about the kind of knot I had used to tie him up (very unkind, I'd say). With the motor on we retrieved much of the line and finally got within about 30-50 ft. of the animal. We were really racing over the water now. I tried to keep the skiff after the animal by watching the faint line of phosphorescence it made where it cut through the water. A drag boat with its net down loomed up and swept past us with amazed Mexicans watching us as we flashed by. Luckily we didn't get tangled. Finally we met the panting men in the other skiff again and we tied them alongside, using the motor to

drive both skiffs. Sometimes we swept around and around as tightly as the skiff would go, following the plunging animal. Frank lept in our boat and he and Boots and Manuel brought the animal up short until just the leader line was out. As the animal swung around us this line would cut against the nearest man. A cry of “arrea” was given (slack) and the line let out before painful rope burns could result. This mad struggle went on until all of us were dragging. I took my turn on the line but my office-tenderized hands gave out long before my will was used up.

Boots lept in the big skiff and shortly had set a small portion of the porpoise net around the animal and our skiff. The big beast became entangled quickly and while the skiffs were lashed together Frank and I struggled to keep the animal's head above water. He was a monster. Frank could just get his arms around its head and I had no chance of making mine reach around its middle. The beast was probably well in excess of 10 ft. long and 600 lbs. in weight. Even with the skiffs lashed no one could help us for fear of having the skiff capsize. So on we struggled. The hook fell free and Frank noted blood from around the animal's eye where the leader had chafed it. Suddenly with a flip the animal wrenched from our hands and dropped into the muddy water and was gone. Later we found three small pieces of bailing wire tangled in the net which must have held the lead line off the bottom. Anyway it was dawning and we had fought the animal more than four hours and it was gone. Listlessly we rowed back to the *San Fermin* and climbed aboard. We decided that we had had enough for one day and so made for the St. Francis.

January 27, 1958

San Felipe

We took it pretty easy today resting from the all-night ordeal. Most of the time was spent wandering around the downtown shopping district of San Felipe and talking to the Mexicans. All of our crew was involved in a big baile, or ball, which was being given or one of the relatives of the captain. The guest of honor was being feted on her 15th birthday, which is something of an event in Mexico.

January 28, 1958

Up early and on board before the crew arrived. We began to wonder if they would make it after the big baile, but they did and we were off. We wanted a day to give our grabber a real try, and if it failed, to use the salmon hook on the tail stock of the animals. We tried all day and had only one poor shot with the grabber though the porpoises ran the bow many times. We tried to use the hook but we had nary a chance.

We spent half an hour observing the little vaquita. We followed two for a time. They were extremely wary. Their dorsal fins are very unlike those of any other *Phocoena*. They are very high and have a slightly recurved posterior border. The vaquitas always blew only once or twice before a long dive which was presaged by a curving of the tail stock. No flukes showed.

At the day's end Frank and I sat down in conference and decided to call it quits. Our reasons were manifold. We had been reduced to techniques which could just as well be done in San Diego Bay and there we would have a much better chance because we would be working from our own boat and would have a five hour run home instead of a sixteen hour one.

We thought that we would like to try a beach net operation of the type I learned about while in Washington. This method was used during the teens to catch *Tursiops* at Cape Hatteras. It consisted of stretching a fine net parallel to the beach and waiting till the porpoises ran inshore of it, then encircling them. Even though they were perfectly able to penetrate the net the porpoises would mill while a heavier net was set inside the light, maneuverable one. Then we would be able to take our pick of the porpoises and to handle them easily.

The other expedient would be to try the hook. Instead of hitting a heavy muscular area like the head or body muscles, we would aim for the tail stock which is sinewy and cartilaginous. Then, we felt that the process of opening the wound for cleaning was a bad one and may have done much more harm than good in previously hooked animals. The water would immediately contaminate the wound and reinfect it. Instead we would rely on shots of antibiotics in the wound area and intra-muscularly to bring the animal around. Both of these methods seem promising to us as a source for this most difficult of animals. Our resources are not yet exhausted. So we packed our gear and got a little sleep.

January 29, 1958

Home

After a little walk along the beach north of San Felipe we drove home, having no trouble at all with either customs. Frank made his escape without ever getting hit for the three-dollar fee, and is probably still gloating about his success.

Sturgeon Trip: November 1955

Tursiops Reconnaissance, Baja Coast: June 1956

Reconnaissance Trip to British Columbia: September 14-27, 1957

Letters from Hawaii: September 1959

Sawfish trip to San Blas, Mexico: February-March 1960

Sturgeon Trip: November 11-16, 1955

November 11, 1955

Never underestimate an Italian or his curses. Both proved their worth on this trip. Dagos, as Frank and Boots prefer to call themselves, have a strong superstition that no new venture should ever start on Friday. Oblivious to all this I scheduled our trip to start Friday night. We were headed for San Francisco Bay to try for sturgeon. These peculiar, archaic fish live in the Sacramento River and in the upper part of San Francisco Bay, or San Pablo Bay. Early in the century they were fished unmercifully until they became practically extinct. In 1921 they were placed under complete protection. Last year they became numerous enough again for them to be fished by sportsmen during a limited season. Dr. Calhoun, Director of Inland Fisheries for California arranged for us to capture a few of these strange fish for display, in exchange for our cooperation in their program of study relating to the biology of the sturgeon.

We loaded our big truck and put aboard a few fish for the Steinhart Aquarium and left Marineland at about 9 PM. It was bitter cold on the Ridge Route. I was worried for fear the temperature in the fish tank would drop so low that the fish would die. They were subtropical grouper and cabrilla and had been living in the uniform environment of our tank for a long time and probably could not stand very low temperatures. I decided that we should shut off the aerator for a while. Most of the heat loss occurs as the water is sprayed through the cold air. Cold fish breathe very little and can go for fairly long periods without aeration. We stopped in the valley below and Boots looked at the fishes and found them doing well. The rest of the drive to San Francisco was uneventful but enlivened by stories about Frank's numerous relatives. He seems to have an inexhaustible supply of Mafia members, pecan farmers, and clothing dummy manufacturers among his family.

We found Steinhart Aquarium at about 11:30 AM and finally unloaded our animals safely into their new homes. We caused quite a stir charging among all the spectators with our stretcher containing a flapping grouper.

I made a brief stop at the Museum of Vertebrate Zoology to check some porpoise skulls important in our forthcoming description of a new species of porpoise from the Gulf of California. Frank and Boots went out for coffee. Dinner and a motel room and some much needed sleep.

November 13, 1955

During the night it had begun to rain and by morning the wind was blowing from the south and the rain fell in a blinding shower. The road took us up along the shore of San Pablo Bay, past the Carquinez Straits where the Sacramento River enters the bay, to Antioch, where Cal. Fish and Game has a field research station. We poked around the

river, looking at all the boats and watching the diehard striped bass fishermen huddled in the rain along the banks. A truck carrying hot soup could have made a fortune for a man on a day like that. Back at Antioch we signed in at a motel and went to a show—something about the south seas and black pearls. I was struck by one sequence where Dennis O’Keefe and Virginia Mayo wrestle with a giant rubber octopus in a freshwater lagoon which guards an underwater cave full of sacred black pearls. All ended well, however, with the hero making off with Virginia and the villain first getting stuck through with a great spear and then getting blown sky high by a lot of black powder.

Back at the motel we squashed the black widows we found lurking by the furniture and then listened to some more of Frank’s relatives and went to sleep.

November 14, 1955

We were up early and down at the field base. Shortly a state car drove up and a swarthy fellow shouted a lot of unintelligible words at us and waved his hands in circles. Another dago! This one was Vince Catagna, the fisherman for Cal. Fish and Game and he was waving to us to come have some coffee. We met the others, John Skinner in charge of the research on sturgeon and striped bass, Bruce Kimsey, another biologist, and a summer assistant. We drove to Carquinez Straits and boarded the little research vessel *Striper*. She was about 27 ft. long and had a big net reel mounted on the stern. I saw Frank and Boots eyeing the trammel net wound around the reel. They picked up the strands of webbing a silently inspected the knots and the twine. Without uttering a word they told me that the net was somehow “no damn good.” It wasn’t either. Before we were through it had ripped in 20 places and the largest fish had gone through.

We pushed out into the river and downstream to the entrance into San Pablo Bay. It was biting cold, windy, and overcast. John Skinner told me a little about the sturgeon. There are two species in the bay—the white sturgeon that reaches over a ton in weight and 19 ft. in length and the green sturgeon which seldom exceeds 300 lbs. The green sturgeon is covered with a series of extremely sharp, hooked plates which make it extremely difficult to handle. It has a long, hooked proboscis in addition. The white sturgeon is much less dramatic except for size. One was recently taken up the Sacramento River that had 350 lbs. of roe. This roe is the basis of the finest caviar and sells for \$3.00 per pound on the hoof. John and his crew had tagged over 1,000 sturgeon in the year past and one had been recovered far up the Oregon coast.

Strangely enough these peculiar, sluggish-looking fishes are far from sluggish and constantly jump out of the water. We saw perhaps 15 fish leap into the air during our few hours on the bay. The power of the sturgeon is great and fishermen fear to bring large ones aboard as ribs have been broken and boats splintered.

We set the nets twice before our fish hit. We could see them thrashing around in the trammel. We reeled the net in and the fish were hauled aboard and tagged. They simply lay stretched out on the deck on the trip back, which took about 45 minutes. This exposure seemed to do them no harm. Boots was down below peering at the hull of the *Striper* and he told me that we had lost the biggest fish as they tore through the old net. “Our net would have held them,” he said, as he poked at a couple of cracks in the stem of the boat.

We loaded the fish into a stretcher and ran them up the dock. They swam off into the depths of the tank as if they had never been out of water. We drove off down the road

and stopped at a big motel in Port Chicago. We rented a palatial suit of rooms for \$7.00 per night and set up a four-hour watch on the pump truck. The little auxiliary banged away evenly until my watch. Then at 1:30 AM it stopped. I rushed out, thinking an irate inhabitant of the motel had shut it off to stop the din. I started it again and it ran very unevenly. Finally I found that a little access plate had come loose and had fallen into the governor, shutting off the engine. This was easily fixed so things went well until morning. After breakfast we started for the Martinez dock, where we were to get striped bass. About five miles away the truck started to make an awful banging. Various theories were advanced but the only concrete thing we knew was that the oil bath had been blown off the top of the carburetor and had spilled oil all over everything. We limped into a nearby gas station, popping and banging. When we were 300 yards away from the station the attendant had our case diagnosed properly. He said a valve wasn't working and that raw gas was blowing back into the carburetor. "Lucky you didn't have a real explosion and a fire," he said. A couple of hours and \$7.50 later and he had it fixed. Boots and I went on down to the dock to find the others out on the *Striper*. We looked over every boat in the bay including a lot that were "built in the dark of the moon with an axe in the backyard"—or so Boots said. Then Boots found a nice little white-haired man waving his hands in the air while talking to a tugboat captain. Sure enough he was a "dago." The rest of the day was spent exchanging uncles and aunts and fishing advice, amid much gesticulating. I enjoyed it all but have not yet mastered all the gestures.

Finally the boat came in with no fish and we jumped in the truck, said our goodbyes to our new friends and started for home. We were all anxious for the welfare of the sturgeon who had been in the tank too long already. Darkness found us on the main highway. The truck traffic on Hwy. 99 is incredible. I counted 298 trucks and semi-trailers in about 45 minutes of driving.

Temperatures were near freezing as we started up the Ridge Route. A long line of creeping trucks wound up the 6% grade. When we were nearly to the summit I noticed that the temperature of the motor had begun to climb. Almost as soon as I noticed it, it was boiling furiously. We stopped amid great clouds of steam, which poured from the exhaust manifold and the muffler. People behind us could not see for the fog. We let it cool for a long time while we shivered in the cab. Boots and I worried about Frank's arm, which troubles him when it gets cold. Finally we filled the radiator with the only water we had—salt. Off we went and made it over the crest two fills later. It was so cold Frank literally could not hold a flashlight on the radiator cap for me to pour in the water. He was shivering too much. Finally we came to Castaic and stopped in a station. We got a cup of coffee and drove down the road to a garage. It was dawn and we had to wait until 9:30 before the mechanic came. He opened up the garage and lighted a big drum stove. We clustered around it, soaking up all the heat given off, like sponges. Our problem was a cracked head he thought. We waited and finally got a new head. It was replaced by about 2 PM. We watched the motor turning over merrily as we breathed sighs of relief, feeling that at last we must be free of the Dago Friday curse. Then I tore a great hole in my pants. He was still with us. Then the truck inexplicably bent a push rod and a valve and stopped with a cough. He was definitely with us. I took one look at the dejected tired faces of my buddies and decided that a picture was in order. I took out the camera and something fell with a clatter. Somehow the slide had broken on the film pack. The old dago monster was going to far. On our way up I had seen the patron saint of collecting

trips twice. His name is Dr. Vandenburg and he is generally an old, wrinkled, white-haired man trudging along the road with a pack on his back and a scraggly beard on his face. If you see him, the collecting is bound to be successful. Our collecting had been good but it wouldn't be unless we got the fish back alive. So, we were having a battle between the Mafia and Dr. VanDenburgh while we stood by watching and got our pants ripped.

Finally at 4 PM the truck was fixed once again and we drove the rest of the way in uneventfully, arriving at Marineland at 6 PM after about 40 hours without sleep. We hoisted the fish into the flume and noted that three out of the seven fish were in poor shape. I guess it was a draw between the good Dr. and the Mafia.

Field Notes—*Tursiops* recon.

June 26, 1956

Frank, Boots, Bill McFarland, Dave, a photographer, Dick Miller, and I left for Ensenada to find out the haunts of the Pacific bottleneose dolphin and, if possible, to try to capture one or two specimens. We went in two trucks. Just north of San Diego the big truck began to clatter and lose power. We feared a broken valve but it was only a tappet which had come unscrewed.

At Imperial Beach we drove down the City Dump road to San Diego Bay. There we were greeted by the sight of a new Buick up to its haunches in the rising bay waters. The most unconcerned owner finally came up in a speed boat. He didn't seem to care whether we pulled him out or not but we did anyway. The guy didn't even steer his own car but stood idly by while Frank and Boots tied the lines and Boots steered his car. He didn't even seem to care that we succeeded. He non-committally took us for a ride in his boat, noting that he had seen porpoise (large, dark-gray ones—obviously *Tursiops*) in the lower bay around anchored navy boats and fairly near to the salt works. This water is 20 to 30 ft. deep at high tide. Frank thinks they can be caught by ringing them with a net of proper mesh size (15-20 in.) and 35-40 ft. hung depth.

We found great shoals of *Fundulus parvipinnins* among the grass and *Salicornia* fringing the water's edge at high tide.

On down to Ensenada where we took a room facing the bay. The room was typically Mexican in that the planning was grandiose but the execution incomplete. The john blocked the passage between the two rooms and the shower with three knobs gave off only cold water. There were three plastered-over doors.

By quizzing local fishermen we found that *Tursiops* often comes up along the coast and into Ensenada harbor where the big animals play among the anchored ships. Generally they come following anchovy schools, it was stated. We were also told *Tursiops* never went into lagoons. This I knew to be false.

We inspected a dead porpoise on the beach about two miles below town. It proved to be a young *Tursiops*.

June 27, 1956

After breakfast we drove to Estero Beach. There we met Johnny Nash and quizzed the local inhabitants who live at the mouth of the Estero de Punta Banda. I suspected these big porpoises go into this lagoon. A few men had seen them in the lagoon once or twice during this spring. The closer we got to the water the better our reports became.

We rented a couple of skiffs and set out to recon. the lagoon. Two large sand bars could be seen from the north end of the lagoon. These were about 300 yards south. We counted 38 harbor seals on one and saw others in the turbulent waters of the entrance. As we cruised up close to them they all jiggled off the bar and disappeared. The Estero waters were clearer at the mouth and became more and more opaque as we went farther up the lagoon. About a half mile down the lagoon we stopped by a little float adjacent to a trailer camp. We asked about porpoise and were referred to Antonio (Tony) Perisky, an old Slav fisherman who had lived on the lagoon for 35 years. He lived in a shack on the sand spit across the lagoon.

Mac had been sitting in the skiff witing for us. He noticed a school of young-of-the-year opal-eye around the floats. They were quite large (about 35 mm). I wonder how many come into the warm lagoon waters? The areas near the lagoon mouth are all sandy. The nearest kelp beds and eel grass beds are 4-5 miles south. But somehow these fish found their way in.

We cruised over and met Tony. He was a gray-haired, weatherbeaten man of 65 or 70, with sparkling blue eyes and a kindly face. He answered our questions carefully in perfect English. I have every confidence that his observations are thoroughly accurate. He told us he often saw porpoise in the lagoon—once or twice a week. Usually they came in at high tide but ocasionaly at other tides. They went clear to the south end of the lagoon on occasion. Groups of two or three to 30 animals had been seen. He could only recall one kind in the lagoon. These, he said, were dark gray and some were very large. He would guess that some dead ones he had seen ran 18 ft. in length—anyway, longer than his 16-ft. skiff. During the war years (1941-1945) he had fished the lagoon for soupfin sharks and had caught tons of this fish in gill nets. Many times porpoise had gotten behind his nets but they had always skirted the nets and swam away. This occurred even though the water was virtually opaque most of the time. His nets were nine in. stretch mesh and tied of heavy cotton twine. He had seen the *Tursiops* harrying the schools of croakers that come into the lagoon and had, several times, seen them toss 2-3 lb. croakers into the air and catch them again as they fed on the fish. He reported that schools of *Tursiops* were even more common along the surf outside the lagoon where they stayed all year. More were noted in summer than in winter, however. He told us that before the war (1916-1941) he had lived at the mouth of the Estero where the motel is now. Many times he had seen killer whales come into the lagoon after the harbor seals. They never came farther than the first sand bar. He recalled seeing an adult with the tall dorsal fin rush after a seal at San Martin Island and strand himself on the rocks as the swell receded. The next wave floated him off.

The old man had fished lobsters all along the Baja coast and had once had a camp on Natividad Island. We left him after inviting him to come to Marineland as our guest. We cruised through the whole lagoon and sounded two of the narrowest parts. In each case the water was about 25 ft. deep. The lagoon is surprisingly narrow and straight

throughout its length. The old man had told us that it had been much wider when he first came in 1916 (from his description about twice as wide). The lagoon is now about 100 yards wide throughout its length, widening at the blind end into a broad shallow bay. A few channels run off the main lagoon on the inshore side and two or three narrow ones on the sandbar side. Tony had told us that the year he first came to the lagoon he had seen a gray whale enter the lagoon mouth and swim down to the first sandbars and turn and leave. He said there was the skeleton of a whale in one of the shallow inlets about half a mile down from the entrance on the inshore side.

It looks obvious to me that alluvial materials from the two large arroyos are tending to narrow the lagoon.

We cruised down to the spit at the entrance and landed there. I found the body of some sort of a cetacean about 16 ft. long. The skin was still on in some places. The flippers looked broadly oval and no pattern could be made out. The skull was buried in the sand. I tried to reconstruct it and put together the basicranium and picked up the ear bones and the bones of the palate. I could not tell what it was.

We went back to town and spent a little time on the pier looking for *Tursiops* but none appeared. That night was spent in Tijuana and the next morning we made a few sets at Imperial Beach for *Fundulus*, taking 2-3 thousand. Then to Marineland and home.

1957 Reconnaissance Trip to British Columbia

September 14, 1957

The first stop was Santa Barbara where we visited the Marine Station and inspected the water system. The water circulating system at Santa Barbara is quite interesting. A sump is set in a hole in the shale which underlies the sand along the beach, the surface of which is about a foot and a half below low tide. This sump extends down about six ft. below this level and is filled with graded gravel and sand. At the bottom is a transite arbor infiltration plate and this connects with a transite pipe which extends from the infiltration gallery up the beach. This transite pipe is cemented in place in this trench cut into the Monterey shale. This pipe extends up to two centrifugal pumps, one being a standby. The system by which the water is sucked out up the infiltration pipe is most interesting. There is a circuit of pipe which extends from the storage tank past the end of the transite pipe leading from the infiltration gallery and back to the storage tank again. The centrifugal pumps are in this line. As the water cycles through this circle it passes a venturi at the end of the transite pipe leading from the infiltration gallery. This serves to suck the water from the sea filter into the system. If 60 gallons of water are recycled through the system the 40 gallons of new water are brought in by the venturi into the storage tank. There are two storage tanks up on a hill above the laboratory. The water comes down to the laboratory by gravity. It is discharged into a lagoon on the other side of the laboratory. Wet benches are used in the laboratory which are coated with a very heavy grade of building paper. This tar paper has been covered with a good many coats of a paint which is known as Gilsonite or Gillicote (Fuller trade name). This gives a hard, resilient black finish to the building paper which seems to make a very nice top for the

water tables. In the back of the marine lab there are two tanks which are made of fibre glass. These are about six in. deep. They have two overflow pipes at the center of each of these tanks. The water comes in from the top and overflows into these center standpipes. These look like very efficient holding tanks for small fish. The air lines running through the laboratory are made of copper and the water transport lines are plastic and have given good service. The plastic was not Uscolite. The air lines were discharged through very small pet cocks, and allowed the use of small diameter rubber tubing to the airstones. This is better than the system we have at Marineland. Most of the tanks which were used were small redwood storage tanks with glass on one or two sides.

Next, we went up the coast to Monterey and made an attempt to get into the Hopkins Marine Station but found no one there. We walked out on the fishermen's pier at Monterey and somewhat to our surprise found an aquarium in operation there. This aquarium was named the Wharf Aquarium and is run by Mr. and Mrs. Nelson Hyler. The aquarium was small but was well lighted and extremely neat. It was, I think, a good show and worth the 35 cents they charged for admission. The most useful piece of information we gained from talking to Mr. Hyler was with regard to small display tanks which he had hung on the walls of the aquarium. These were covered with a sort of a framing set out at an angle from the wall so that the tank appeared to occupy a blister on the wall. This frame could be lifted and was hinged at the top. To service the tank the frame was lifted and the tank exposed. This system used single tanks which were independent of any continuous water supply. They were heated with a submersible thermostat and each had a separate aeration system. This sort of display could be very useful at Marineland for the spaces between the columns and could be adapted to a large number of different sizes of tanks without much trouble. I think it would be a very useful thing for adding to the number of displays at Marineland for a very nominal cost.

He had a seal tank which was made of fibreglassed plywood and had had it for two years. He said that he had had no trouble with it at all. It looked in excellent condition. Amongst the displays were a number of standard freshwater aquarium fishes such as the blind Mexican cave fish, the electric catfish from Africa, neon tetras, etc. Piranhas were there. He also had one electric eel. He had a small bank of saltwater tanks on the other side of the aquarium which were serviced by water pumped from the Monterey Harbor and discharged back into it without any recirculation. These were made of concrete. The concrete was a special lightweight type. It was soft enough so that you could dig your fingernail into it. Each had a metal rim at the top which Mr. Hyler admitted he didn't like. He was using a plastic recirculation through his aquarium. He seemed to think that he was the first one to do this but this is not so, of course. He was contemplating installing a porpoise tank out on the end of his aquarium in a space of about 20 by 30, planning on a tank about five to six ft. deep. He was interested to know if he could obtain a porpoise from us. He had two octopuses which he kept separated in cement tanks which were approximately 4 ½ ft. long, 1 ½ ft. from front to back, and about 3 ft. deep. He said he kept these octopuses on the average of 4 1/2 months. Apparently he never kept them together. His water temperature was at about 60 degrees when we were at the aquarium and he said it did not rise above this. I was impressed that the major part of his display was composed of standard aquarium fishes and yet it was very attractive and certainly was the mainstay of his exhibit. It seems to me that we are missing a good bet at Marineland by not putting in some such material here. He had a

specimen of *Girella nigricans* in one tank and said that about 120 of them had been taken at one time in Monterey Bay by a gill netter. These were the only ones he had seen in his two years on the pier. He is an instructor at San Francisco State College.

September 15, 1957

We started out this morning from Monterey and went directly to Pt. Richmond where we talked to a couple of men who were fishing there. They seemed to be old residents of that area. They mentioned seeing porpoises swimming behind or with the San Rafael ferry. This ferry is no longer operating. Their description of these animals was very sketchy but we did find that the animals were apparently quite large. One man thought they were about 14 ft. long which sounds doubtful and four tons in weight, which sounds even more doubtful, that they probably had pointed noses and that they were probably gray which sounds a good deal like *Tursiops*. They could tell us nothing about *Phocoena* in the Bay but directed us towards the whaling station which is on the north side of Richmond. Before we left they told us that we might be able to obtain pictures of the porpoises that swam with the ferry from the Richmond Independent, a newspaper which apparently has published these pictures in the past. The Whaling Station is on the north side of Richmond at Mapelo Point. The station is a large building with a rampway out in front which extends into the water. The whales are hauled up onto a big vacant floor and there flensed and sawed with big rotary and straight saws. No one was at the plant when we were there so we left. We went across the San Rafael Bridge and stopped at its base and asked some people at the Rod and Gun Club there if they knew anything of these porpoises, and they said they knew nothing of any porpoises in the bay but were familiar with ones outside. We then went down to Stinson Beach via Highway 1 and stopped to talk to people at Bodega Bay. There we talked to a skipper of a fishing boat and he told us that he had never seen any porpoises inside of Bodega Bay but had seen animals a couple of miles outside the entrance. His description sounded very much like *Lagenorhynchus*. We left Bodega Bay and continued north along Highway 1 to Fort Bragg. At Noyo, just south of Fort Bragg we talked with a man who was reputed to know a good deal about fishing conditions. He told us that they were having an extremely warm year. As evidence of this he said that the water outside the entrance of the river was at 60 degrees on the day we were here and is usually somewhere around 42 degrees at this time. He mentioned that there had been two opah taken in this area. He also mentioned the presence of white sea bass which had been taken locally, that blue sharks had been seen in this area. The ling cod which usually come into shallow water around this season had stayed in deep water. He said that there were no anemones locally which would be good for display but suggested that we go to Tillamook Jetty in Oregon where he said there were many beautiful examples of different colors. Once again, there seem to be no *Phocoena* here, but he mentioned seeing animals which sounded like *Lagenorhynchus*. These animals were supposed to be about three miles offshore. He felt that the poor salmon fishing season was connected with warm temperatures. His name was Mr. Reese.

September 16, 1957

We started today from Fort Bragg. We might mention before going any further that while talking to Mr. Reese at Noyo, he said they had seen a sea otter offshore lying on its back and feeding on what they presumed to be an abalone. Apparently the

fisherman had had a good chance to observe as he knew what the creature was. We came up the coast and finally got on a main highway after a long delay and went to Humboldt Bay and Eureka and went to the fish docks there and were unable to get any information of any value to us. We then went on up the coast to Crescent City and went into the Crescent City Aquarium which has many earmarks of a McBride operation. When you go into the entrance of the Crescent City Aquarium you have to enter through the gift shop which is cluttered with all kinds of junk, all sorts of shell lamps, and then you go into the Aquarium itself. The admission charge is 50 cents and the Aquarium consisted of a small room about 40 ft. long and perhaps 20 or 25 ft. wide. The displays were very small wall tanks, I would say not much more than a foot by a foot in some cases, up to larger tanks that were perhaps three ft. long. Under them were tanks into which you looked from the top. These extended out underneath the tanks above so that you could only see into part of them. These were considerably larger than the upper viewing tanks. The most impressive display they had, as far as I was concerned, was an anemone display composed almost entirely of white *Metridium* anemones and a few *Anthopleura* anemones of a lemon-colored shade. They had one harbor seal outside and you could also see him inside. Its name was Bubbles, interestingly enough. They had one sealion. Other displays were of the seatrout or greenling, *Hexagrammis*, a number of rock fish, a few star fish, one small wolf eel, a 20 lb. octopus in one of the horizontal tanks on the floor, one raja maclata, some starry flounders, and an exhibit of small flatfish which was very unimpressive. They had an exhibit of tube dwelling worms which was interesting but badly done. The room was dark and the ceiling was hung with nets. Altogether it was a most unimpressive place to me. I would say that a quarter of the display was made up of anemones and about half of what remained made up of rock fish. A little separate room adjacent to the aquarium room was called the whale room. It contained a pickling vat which had a 12-ft. foetal finback whale in it and also a pickled pilot whale, which they called a killer whale. They had some foetuses of humpback whales and some other mementoes of the whaling industry plus such things as an ice cream machine and some old beat-up typewriters and other things of the sort. They also had some exhibits of pipefish. They called the pipefish a "rare needlefish." There were several things in the aquarium which made me think they had some southern California connections, probably McBride, and the pilot whale was one of them as they're quite uncommon along this coast and of course are very common in our area and the pipefish was another. We went down to the community dock where the fishing boats tie up and talked to three different fishermen and were able to get some information. They have seen no porpoises in the harbor at all though they do see some porpoises offshore, around the St. George's Reef in particular. One of the fishermen had seen some recently. His description fits *Lagenorhynchus* perfectly. We got no reports any place along the coast of any harbor porpoises. We asked about the warm water which is prevalent offshore this year and he said that they had had a tremendous influx of blue sharks which had consistently taken the bait off of their hooks. Also when they'd catch a salmon the sharks would leave them nothing but the head. They mentioned that the salmon fishing had been extremely poor. They had had a very bad season and they blamed this on one of two things—either the warm temperatures or on the fact that the stocking four years ago had been interrupted by a flood and so that it hadn't occurred in that year which would be presumably a part of the catch which would be returning this year. He mentioned pulling in his crab trap and

feeling that they were still warm from having been brought up from the bottom which indicated to him that there was warm water down to the bottom, which sounds reasonable. He mentioned an influx of *Velella*, the “by the wind sailor,” which he, of course, called the Portuguese man o’ war. He mentioned that one man had taken surface temperatures here in an attempt to avoid the areas where he couldn’t catch anything. He had recorded temperatures as high as 69 degrees and this was about a hundred miles offshore. Local sea temperatures are somewhere around 58 to 60 degrees now.

September 17, 1957

We drove across Oregon today and made our only stop at Corvallis. There we visited the laboratory of Peter Doudoroff who works in conjunction with the U.S Public Health Service and the Fish and Wildlife Service and the Oregon State University and the Oregon State Fish and Game Department. He is the head of the Fisheries Dept. at the University. After leaving the laboratory we came to Portland and took a room for the night where we will tomorrow visit the Washington Park Zoo and continue northward to Point Defiance and Seattle.

September 18, 1957

Our first stop today was at the Washington Park Zoo in Portland. This zoo is a small affair on the side of a hill. Some of the buildings are very old and in need of repair—or better still—replacement. However, as a general rule the place was quite neat and the animals looked in good condition. We inquired to find out the status of the Portland Aquarium and found that it had not been built. It had been taken off the budget because of building expense and had been indefinitely postponed. Parts of the new zoo are being built over the hill in a canyon. The bear pits were already practically completed. The impression I got was that they will be bringing in a director for this aquarium section, presumably a Curator at such a time as it is built. We left Portland and continued on towards Tacoma and finally came to the Port Defiance Park, which in my estimation is rather difficult to find. The signs leading to it are small and it would seem rather easy to get lost. The park itself is a very pretty affair set on a point which extends out into the southern end of Puget Sound. It’s all covered with many kinds of trees and is quite beautiful. The aquarium itself sits in a very old frame building which is partially on a pier connected with a boat dock. It’s a two-story building and the aquarium occupies the lower floor. What was in the upper floor I do not know, probably some kind of storage. We toured through the aquarium which has about 40 tanks in it, some of which I would say were about 250 to 400-gallon capacity and the smallest tanks I would say ran somewhere around 40 gallons. The displays were varied and included a large number of very interesting invertebrate animals. We met the director whose name is Cecil Brasseur. He’s a very personable fellow. I would say he was in his forties, obviously a good aquarium man and one who handled his animals well and took considerable care with them.

The saltwater circulation system began at a pipe about six in. diameter which was strapped to one of the pilings at the end of the pier. It extended down into water about 25 ft. deep. It ended about five ft. above the bottom. Water was sucked out of this pipe, I presume to keep the kelp from going over the intake of the pipe itself. There was another pipe extended down into this one of larger diameter. The tidal range is about 12 ft. in the

area and their intake must have been extended below this level. They use direct drive centrifugal pumps. The water was circulated through what looked to me like Uscolite pipe. This extended up to the aquarium, the pumps supplying about 80 gallons per minute, part of which went into a bait tank system in another part of the pier and the remainder into the aquarium. They were getting somewhere around 50 or 60 gallons a minute into the aquarium itself. Then the water went into galvanized pipes which distributed the water over each of the tanks. From the galvanized tanks a T came off, went through a small valve and then dumped into the separate tanks. There was no recirculation at all in any of the tanks except for one tank which held a garibaldi. It was heated with a small aquarium heater. The small valves on the inlet to each tank were for the purpose of allowing the main pipe to be backwashed with hot water to kill the nauplii of barnacles encrusting inside the pipes. He said he did this once every couple of months. His valving was so set up that he could run this hot water into the pipes, close off all the tanks and then release the hot water out to drain. Once the water was in the tanks it spilled over with a conventional overflow into a channel which ran between the tank banks. The channel was coated with a heavy grade of tar paper. The water merely ran by gravity down in this channel and back into the Sound again.

The worker cleaning the tanks walked along a cat walk which was suspended over the top of this channel. The tanks themselves were made largely of glass. They had metal framing and this metal framing was obviously of iron and was in extremely bad shape. The number of invertebrates he kept attested to the fact that he was getting no contamination of any significant amount in the tanks from the galvanized pipe or brass valves. I presume this was because of the large flow which ran through the pipes. I'll go through some of the displays which were in this aquarium. First he had several displays of anemones from the Puget Sound region, including a nice display of *Metridium senile* which is common along our coast as far south as Point Conception. He had some very nice *Tealia* which apparently are relatively common and can be obtained at the lower part of the intertidal zone or just sub-tidally in this area. They didn't cling to the pier pilings but were much more common on the rocks and therefore were a little more difficult to obtain. He had a couple of species of *Cribina anemones*, some of which were extremely beautiful. He had our local form of *Xanthogrammica*, and he also had a species of *Tealia* with a beautiful reddish base and transparent tentacles. It was quite a beautiful thing. Next, the octopus tank. He told us several interesting things about the octopus. He is able to keep octopus as long as two years in his tanks here, his water temperature ranges between about 45 in the winter and up to about 54 degrees in summer. He said that he had difficulty keeping any of the large octopus alive for more than a couple of weeks up to a couple of months. Therefore he didn't even try to keep them. He was able to keep the smaller ones and preferred animals to weigh in around 20 lbs. He stated that he found it much better to keep the octopus in a small tank where they didn't seem to batter themselves. He also found that the ones he had in storage looked better than those in the observation tanks. This is the same sort of thing we've observed. He felt that this was due to the fact that the octopus was kept in constant light in the display tank and was allowed to be kept in the dark in the storage tank. He mentioned that he had tried to provide octopus with shelters made of glass jars into which they could creep and yet in which they could still be seen. I don't recall what success he said he had with this. The octopus are said to disappear here in the month of July. This is the same sort of thing we have in

the south. They seem to be obtainable in as little as five ft. of water and are caught right of the dock at Port Defiance. He had a tank with dog sharks and leopard sharks and a couple of rajids. On the other side had had a series of misc. tanks holding such things as the swimming scallop shells, the purple-hinged scallops, and a series of sea cucumbers. Some of the Echeuroids are beautiful things. They extend tree-like tentacles out one side of their body and actually fish in the water with them, straining out small particles. Periodically they insert one branch into their mouth and withdraw it. Then they insert another one, etc. Some of these animals have bright-red branching tentacles. Then there were sea quills which were bright orange in color. They are fluffy creatures which are phosphorescent at night. These animals are eight to ten inches long. He said they were easily obtainable in the Nisqualli Flats area of Puget Sound at low tide and that he dug them out like clams. He had a number of very interesting small fish—perhaps the most fascinating of all was *Rhamphocottus*, called the sea pig. It is a very peculiar little cottid fish, which actually creeps around on his belly. It's the weirdest little creature I ever saw and immediately attracted the attention of all of us. The fish lived in little bottles. They were the most grotesque fish I have ever seen and would make a wonderful small tank display. He also showed us the sailfin blenny *Blepsius*. There were several other blennies with tremendous quantities of cirri on their heads, of various sizes and shapes, all of which were very interesting display material. He showed us the Irish lord which is a large cottid fish, with mauves and wine red color, whites, and a very very striking creature. Then we saw an *Enophrys bison*, another cottid which is not as pretty but is a striking animal.

The sand launces were in another tank and were very interesting. He had the sable fish and several species of rock fish in various tanks. As a whole his fish display was not too exciting with the exception of the *Blepsius* and the *Rhamphocottus*. He had displays of various mollusks in the area including the geoduck (gooey duck). It was in a tank by itself and was rather an obscene-looking object. It made an interesting display and apparently caused quite a lot of comment because a lot of people didn't believe there was such a thing. There's nothing in his labelling system or in the display methods which is of much value to us because it was all very archaic. Another display which I must mention were Serpulid worms, some of which are very beautiful. One tank was virtually filled with tube-dwelling worms which must have been more than a foot long. The tubes were considerably more than a foot long ending in a plume of purple and greenish gills which are extended and which could be made to retract by tapping the glass. They would retract very quickly and then extend again. These are apparently very common on pilings in this area and I think would make a perfectly fabulous display for Marineland. In one tank he had a display of wolf eels which were impressive. I might mention that in some tanks he had let the glass separators, the glass walls in the tank, the front and back get covered with Bryozoans and also with barnacles. One tank was encrusted with tunicates. These made a very effective display because the barnacles were kicking their legs out of their mouths constantly and making a lot of motion which made a very interesting sort of backdrop for the tank.

Mr. Brasseau told us that they were planning to build a new aquarium at some time in the future as part of a program of expansion of the parks and recreation facilities of Tacoma and that his section of it would amount to \$250,000. He hoped to build an aquarium consisting of a series of tanks around a central tank which would be something

like 60 ft. long and 20 ft. wide in the center of which would be an island. This island was for the purpose of blocking the viewer's vision across the tank so that he would have a continuous view around his island. I think this is a very good idea. The admission charge was 25 cents, and I think it was well worth it. Outside the aquarium he had one Galapagos penguin which he had had there for some time. This was a true Galapagos penguin and not a Humboldt penguin like the ones we have. He said that in the wintertime he had to give it shelter. I thought this was kind of ironic for a penguin. He had the largest harbor seal I've seen. It was a big male that had been in captivity for 19 years. He was really an enormous old beast. He must have weighed 400 to 500 lbs. He also had some smaller ones, including a baby one that he was trying to save from starvation. It had become starved and his method of force-feeding it was quite interesting. He had a syringe with an enema attachment which I'd say was about 15 to 17 in. long. He filled the bulb with milk in which he had dissolved penicillin tablets. He inserted the tube into the little harbor seal's mouth and pushed it clear down into its stomach. Then he slowly forced the milk into the seal's stomach. He said that if he did this too fast the animal would regurgitate it all and that he'd have to start over again. He had had one harbor seal that had begged to have this done to it. He said that he had to make the little seal defecate first before it would keep the milk down. He did this by pushing it into the cold water. After it was finished with its milk he put a herring in its mouth and very gently held the little seal's jaws closed and massaged its throat so that it swallowed the fish. It swallowed three in this manner without any trouble.

I might mention a few things about the boat facilities here which were very interesting. They had put in a new pier which included a large, broad landing area on which they had many skiffs stacked. They had a hoisting device for boats which consisted of a platform which was raised by four cables. A person wanting to lower a boat merely rolled the boat onto this platform and moved his trailer off, then got into his boat, and was lowered into the water and floated out over the platform and rowed out into the Sound. When coming back in, he merely rowed into this garage-like affair and the platform raised up underneath him and lifted him back on top of the pier. It seemed like a wonderful way of doing things. In our particular situation, Frank thinks that the surge would make it unusable. Mr. Brasseur said that he would be glad to help us collect at any time that we wanted to come up this way, and I think he would be a wonderful person to work with because he obviously knows the area well and seems to be a good collector.

We left the aquarium and drove directly to the Woodland Park Zoo in Seattle and there met the director, Dr. Johnson, a very nice fellow. We discussed the sea otters with him at some length. They still have one in captivity. We took a look at it. It's one of the most remarkable beasts I have ever seen. Its skin was as limp as it could possibly be around the animal. He seemed to move around inside of his skin without regard to where the skin was going, constantly preening himself at all times. The animal surprised me by being smaller than I thought it would be, though this animal was apparently a full-grown female weighing about 40 lbs. The hindfeet were very strongly webbed and were used for swimming in a very efficient way and the tail was used as a rudder. When they brought the animal in it was on a feeding schedule of once every four hours. Finally they had got it down to the point where they were feeding it three times a day. It was eating such things as little crabs (which it ate whole, shell and all) and shellfish (which it cracked on the side of its tank) At one time it cracked them on its chest in the manner which had

been described in the literature but finally abandoned this and started cracking the shellfish on the side of the tank. It had actually knocked off a considerable amount of the cement along the edge of its little tank. They had had two sea otters originally, which were flown in from Amchitka but they only had one at this time. The other had died about three weeks after it had been brought in. The living animal seemed very well adjusted in captivity. I was surprised to see its ribs showed through its skin. This indicated to me that it, as Dr. Johnson told us, didn't have any fat layer and apparently for this reason had to eat constantly. However, as I mentioned, they had gotten it down to three feedings a day. It was living in fresh water. In addition to the shellfish, it ate whole herring.

September 19, 1957

We spent the night in Seattle. This morning Frank and Boots took me over to the University of Washington. They left me there and I went into the Department of Zoology while they went over to the north lake and inspected Harry See's boat which is under construction there. After talking for a while with Dr. Snyder, the herpetologist, I left the Zoology Department and went down to the fisheries laboratory which is housed in a new building alongside Lake Washington. The first person I met coming in the door was Dr. Albert W.C.T. Herre, the old gentleman who has been working with bryozoans and fish for a good many years. I spent a little time talking to him about *Amphiprion*-anemone relationship. I left Dr. Herre after he had run me up and down the halls at a great rate of speed and had introduced me to Dr. Field, who was a professor of fisheries and a comparative psychologist from Ohio State. He is using psychological techniques on fishes and seems to be a competent person. He was doing Skinner box training methods on trout and also had done activity studies and was connected with the studies of reaction of trout to light. He mentioned that they had found that fish could be attracted to very low light on very low wattages. A 75-watt bulb which was run down to about 10 watts was apparently quite a strong attraction to fish even through the very murky waters in a glacial-fed stream. They were now trying, instead of producing a light barrier to repel fish towards a fish ladder, to attract them by means of this low light intensity attraction. He seemed to think that this was going to give them much more success than the former method, which is the one that has been publicized in the past. The program apparently has come to an end and various personnel have been let off. The program had been sponsored by the Army Corps of Engineers in connection with their dam-building program. We inspected the apparatus that they used for this purpose and it consisted of a long trough about 20 ft. long and perhaps 7 or 8 ft. wide which was divided in 3 channels and into which an artificial current could be run and the fish manipulated from there. The impression I got was that the fisheries department was spending tremendous quantities of money on these experiments, far greater than any place I visited before, whether their results will warrant this, of course is something else again. We then went in to look at an activity wheel which had been constructed and it was large enough to hold approximately 10 tons of water. It was electronically controlled through a series of cams. The velocity of the rotating wheels could be measured very carefully. He stated that in this wheel they could simulate velocities up to 10 ft. per second or thereabouts and that instead of using cue marks (which is what we plan to do on our experiments) he had used a light barrier through which the fish does not want to pass, behind which were two electrodes

suspended in the water so if the fish did go through the light barrier it was shocked. The fish were brought in in a darkened box and were released in facing upstream ahead of the light barrier and would go around the activity wheel to the opposite side away from the light barrier trying to get into the darkest parts of the tank and apparently good readings were obtained in this way. Dr. Fields seemed to think that this apparatus was not satisfactory as a straight channel apparatus into which the fish could be put and through which the water could be flowed at a given rate. Once laminar flow was obtained he thought the apparatus represented a much more natural situation and that the fish reacted better. It was also a more portable apparatus for field work. The channel and the wheel gave final results which were quite similar. Exactly why he didn't like the idea of using a visual cue, I'm not sure. We then went outside and looked at the raceway through which salmon come on their upstream migration directly into the fisheries hatchery which is part of this building. The salmon are brought into a large long trough and allowed to sit here until they are stripped. The eggs are put in the adjacent hatchery and hatched and released there so that the fish go out to sea and four years later come home again to the original hatchery.

We saw Dr. Donelson's trout which he had been breeding for several different characters. The ones that we saw were ones which had been selectively raised for large size. Some of his fish which were three years old ran somewhere around from six to eight lbs. They looked to me like they were notably much more obese than a normal trout. Their body proportions seem somewhat different. Dr. Field stated that he had been able to train trout to do things normal for them in one trial on some occasions, and that the farther he got from the natural sort of thing for a trout the more training it took before this was achieved. Then we met Dr. DeLacey and he took us around the aquarium section. They have a saltwater system there which holds something like between 6 and 8,000 gallons of water. I don't remember the exact figure. The aquarium room consisted of a series of small tanks which were of no particular interest to us. I didn't think that there was anything unique about it. The water was transported mostly through rubber-lined iron pipe and most other equipment was rubber-lined iron. They seem to find this quite satisfactory though I'm not sure that it is as good as other materials in some ways. In one room we saw a doughnut tank which was designed by Dr. Chapman. In it was the adult skill fish which had been obtained far out at sea. The fish was doing very well. It came up and snapped at me when I put my hand in the tank. You could crawl into the center of this tank to view schooling movements or swimming movements. Temperatures available in the aquarium room ranged from about 40 degrees F. up to 85 or 90 deg. The water quality in the system apparently is variable and dropped from relatively high levels to down to a pH of 7 before the water was refreshed. They were bringing in a couple of large loads a year from the outside and they were pirating water from a nearby oceanographic station in the interim. We then went down to the Sand Point Naval Air Base and met Dr. Victor Sheffer and Karl Kenyon, the Fish and Wildlife mammalogists. We had lunch with them there, talking over many things. We talked about the local killer whale population. Dr. Sheffer seemed to think that there was a resident population in Puget Sound which had a regular track in which it moved so that it passed a given point with considerable regularity. He thought that they were probably reasonably difficult to approach and that they could be found most places in the bay. He suggested that we should contact the Washington State Department of Wildlife if we were planning to catch these animals as

their crews could monitor them from the air as a part of their regular program and let us know where the killer whales were located. We asked about the harbor porpoises. Dr. Sheffer told us that they were relatively common throughout the area and that they could be obtained in some of the lower parts of the Puget Sound, around Steilacomb, Willapa Bay and the Nisqualli River area, and he said that they sometimes come in shoal water but that near these areas there was water 20 fathoms or so. He mentioned a man named Phil Putnam who is a collector and aquarist and who occasionally caught a *Phocoena* for the Biological Supply houses. He mentioned a Lawrence Carver who works at Moss Landing who was supposed to know about *Phocoena* in that area. We talked about sea otters at some length and about the problems of transporting them, etc. Apparently it's a matter of time, a matter of the animal's fur becoming covered with filth and becoming wetted clear through, whereupon the sea otters die. It would seem that this problem could be treatable by a lot of different methods than they were using. They were required to feed the sea otters about once every four hours and were using the greenling, *Lexagrammus*, for this purpose, which were caught at Amchitka and carried along on the plane when the otters were being transported. Both of them seemed to think that the California sea otters were no longer under Federal jurisdiction but were now under the State Department of Fish and Game since the last treaty had been signed which omitted the herds from the California area. This would mean that if we were to obtain them that we would have to do it through our own Fish and Game Dept. This might be a very good situation. Kenyon was going back to Amchitka to continue his studies of the sea otter and was having troubles with his budgets. The Fish and Wildlife Service had cut off some of his funds. Dr. Sheffer said that the pilot whale apparently gets up to Washington only exceedingly rarely and that they had had just one specimen of this species taken from Washington waters. That was a dead animal which had been washed up on the beach along the southern coast of Washington. Other reports of this animal probably referred to *Pseudorca*, the false killer whale, or to the killer whale itself, which is called the black fish in these waters. I forgot to note that the Port Defiance Aquarium kept a beautiful species of jellyfish alive, reportedly for as long as two to three months. Cecil Brasseau said that the jellyfish would die if they were left swimming free in the tank. They apparently bump themselves against the walls and die very shortly. He had done something which I thought was quite clever. He ran a string on the end of a needle and tied a button to the end of it, ran the needle up through the center of the jellyfish, actually piercing it, and pulled the button up underneath the tentacles, then tied this thread above the tank so it couldn't be seen from below. The jellyfish was effectively suspended in the center of the tank where it couldn't hit the walls and the wound apparently didn't hurt it any. It could be fed by introducing material into the tanks that would adhere to the tentacles. We may be able to do this with our big purple *Pelagia*, which I'd like to try sometime.

September 20, 1957

We came this day from Bellingham and drove directly to the Stanley Park Zoo and Aquarium. It is set on a peninsula which extends in Burrard Inlet, a beautiful stretch of saltwater lying north of Vancouver. The aquarium building is built in the midst of a beautiful grove of trees and directly adjacent to the zoo. It consists of 40 tanks, one of which is a very large tank about 30 ft. long. In addition to these there are many small

freshwater tropical tanks of the standard home aquarium sizes. The building of the aquarium itself is very modern and very attractive. It is not too easy to find the aquarium. One enters through a central lobby, passes a ticket stand and a book counter. The book counter is one of the most attractive that I have seen and includes a wide variety of books, many of which we do not have at Marineland. Behind the book counter is an open grotto of freshwater tropical plants growing from a little tank containing turtles and alligators. The tank displays themselves were not particularly exceptional. They did have a fine display of the humpback salmon in spawning condition. They are most unusual-looking animals because of their odd secondary sexual characteristics. They have a very beautiful display of anemones of very delicate shades of pink and orange. The large tank was used solely for holding the dog sharks and was not a particularly startling display, though the tank itself was an excellent one and could be used to much greater effect. The lighting over the tanks was often fairly dim and not as good as one might expect. There were a fair number of reptiles exhibited in rather inconspicuous ways—alligators, caymans, and several species of turtle. The freshwater tropical display was quite good and I particularly noticed their backgrounds which were made of reed matting of different colors. They had such small species as the electric catfish, the knifefish, Discus, various other more common critters, a few of the freshwater sport fish, such as the yellow perch and pumpkinseed and so on. One of the most unusual displays they had was of the horseshoe crab which had been sent from the east coast. These animals are very unusual and interesting. The tank decorations were not particularly good in my estimation and many times sands were used on the bottom of the tanks which could be seen to be accumulating hydrogen sulfide bacteria beneath their surface.

The water system of the aquarium is a very interesting one. It is very much more modern than some, yet it still has its faults. It is run by a pump man who also installed the system under contract as the aquarium was being built. Briefly the water system consists of an intake sump which is set out offshore a considerable distance. At this time of year it becomes covered with a bed of *Nereocystis* kelp much to their dismay. The water comes in by gravity through a transite pipe in an unfiltered condition, the only thing being strained out were pieces of kelp which are kept out by a screen. It enters a sump made of circular concrete pipe and is sucked from the sump by a pump which delivers about 250 gallons a minute. This is then forced uphill, all the time going through transite. The pump itself is a rubber-lined centrifugal pump and according to them is giving them excellent service thus far. I was interested to note that the transite which was being used was obtained in a number of different fittings. These fittings were iron on the outside, transite on the inside and led to all transite pipes. They had elbows and tees, forty-fives, etc. The water then passed up the hill and into a storage tank holding forty thousand gallons as I recall, which was under the floor of the pump room in the main building. This is completely in the dark. It is a large cement tank, the top of which forms the floor of the pump building. The water is then sucked up through another centrifugal pump. First it goes through the filter beds and then is sucked up from the sump and circulated about the system. There are three pumps, going to three different banks of the system and they theoretically can be divided off, but at present this is not done and they all go to the same sump. In effect the whole system is run from a single supply. The filter beds were a regular sand-gravel type and were completely inadequate in size to handle the volume of water in the system. They probably have something like half the square footage for the

same amount of water in our system. Much of the distribution system is through plastic pipe of the kind which is held together by hose couplings—sort of a limp plastic pipe which is not threaded. Jerry told us that it was very flammable and that this had been a problem, but that it had been quite satisfactory otherwise. At no place in the system does the water touch metal, the valves being rubber or neoprene diaphragm valves of very large size. They were installing a diatomaceous earth filter for the freshwater supply system. The few warmed seawater tanks they had in the system were warmed within the tanks themselves or within a small supply system which strangely enough had no heating elements supplied to it. They were being warmed by a freshwater garden hose which ran into the sump and then discharging this water back into the freshwater system again. In other words they made a bypass in the hotwater line which passed through the tank and effectively heated it. The heat exchange must have been very poor and must have taken considerable length of time to bring the supply of water up to temperature. The freshwater tropical tanks were heated by heating the room in which they were placed and were kept at a temperature of about 75 deg. The temperature fluctuation in the water of the aquarium was relatively extreme, going as high as about 60 deg. in the summer which was marginal for the survival of the anemones and some of the other creatures on display. The labeling system left much to be desired. The labels were not lighted and since the corridors were reasonably dark it was quite difficult to see them. We had to stand very close to see what the labels had to say. The admission was 25 cents. Murray said that they would bring in something like 1,500 or 1,600 dollars on a good day during the summer season and that in the winter they were lucky to make 300 or 400 dollars. His whole operation is apparently operated on finances derived from this income, though he doesn't have to pay for his building, that being taken care of by the city. On the whole, the aquarium was a very attractive place and had a nice series of displays, but one felt that it could have been more imaginatively done as far as backdrops were concerned, the tanks all made of concrete and decorated only with rocks, etc., which had been placed into the tanks loosely without being cemented into place or any attempt to do final rockwork.

This morning we went to the University of British Columbia. Murray Newman took us around the campus. The first place we visited was the biology building and there we met Dr. Hoar who showed us some of the apparatus which he was using and which his students were using. We then went to see Dr. Ian McTaggart Cowan, mammalogist of the department. We talked to him for quite some time about killer whales. He mentioned that the killer whales were sometimes extremely common around this area. They sometimes occurred in as many as 2,000 animals to a school. These schools were scattered over the sea in smaller groups. They occurred primarily when the salmon were running into the rivers (which is taken place now and continues on a little bit later). He mentioned that the place where they seemed to congregate most often and most regularly was at the mouth of the Campbell River which flows down toward the north end of Victoria Island. Here is a place called "The Pond" where they come into rather shallow water in pursuit of the salmon. He mentioned that the stomach contents of the killer whales which had been inspected in this area showed that they had been feeding largely on lingcod and not on the salmon but they certainly must feed on salmon too. He mentioned the presence of a white killer whale whose course had been charted around the island. It had been seen many times. It apparently had given birth to a partial albino fairly recently. They had seen this other animal and were also able to trace its movements around the

island. He mentioned that one fisherman in the Campbell Bay got angry at killer whales and had charged them with his skiff and had run into them. This would seem to indicate that you can get relatively close to them. Cowan considered this to be a rather foolhardy undertaking. He mentioned that there was a fairly good airport in Victoria from which the animals presumably could be flown if they were caught in this vicinity. From Campbell they would have to be brought down the coast about 100 miles. This would mean, of course, that we would have to work from a large vessel. He mentioned that they occasionally saw the young which were still in the yellow condition like the one that we saw out of San Diego. I asked him if he had any records or information on anyone having been killed by the killer whale and he said that he knew of no one on the Pacific Coast. He mentioned that the blackfish was often seen by the sperm whalers far off shore traveling in large schools, presumably they were coming northward in the warm water along with the sperm whales. The whaling station north of here at Cold Harbor was supposed to have taken about 600 animals last year, but even so to be just making ends meet. He mentioned that we might try the use of a compound called nicotine salicylate which has been used to sedate deer when they are trying to catch, transport, and tag them. A corporation called the Palmer Chemical Co. manufactures pellets of this compound which can be shot with an air rifle into a deer. They are also starting to manufacture a hypodermic harpoon with which larger quantities of the material can be shot into an animal. The effect is to cause the motor nerves to be blocked off so that the animal fails to have any muscular movement. Apparently it doesn't have any effect on the respiratory system. If this works with cetaceans it would be very valuable for us. The effects apparently wear off in quite a short time, within 15 minutes. He seemed quite interested in preparing a television show of Marineland, including work on board the *Geronimo* with pictures of our local cetaceans. His show is broadcast by the Canadian Television Network and apparently goes clear across Canada, so it should be a good advertising for us. He also said that it was being purchased by an American Company. the name of the show was "The Living Sea" and he narrates himself.

September 22, 1957

We went out on the beach and dug clams and ate 'em raw.

September 23, 1957

We visited the Nanaimo Marine Station today. Dr. Brett took me through his laboratory spaces and I learned several things there concerning my experimental gear. He showed us the saltwater system. There is no filtration except through a series of nylon cloths, which served to remove large particles and there is an intricate mixing system using hard rubber pipes and hard rubber valves, which they found quite satisfactory. He was using much larger valves than we have used at Marineland. A student from Australia was there measuring the effect of different salinities upon the lethal temperature relations of herring and Dr. Brett was in the process of planning a new program using adult salmon and was establishing tank space for them. The only major innovation he mentioned in his holding tanks and transport system was a so-called upwelling flow. The water came in from the bottom and forced its way to the surface and it was believed that this would cause the salmon to be more calm than if the water was sprayed in from the top or otherwise. He was going to impart a rotational flow to the water in addition to this and in

his transport tanks planned to use oxygen which was introduced under low pressure into the circulating system. He was planning to use a canvas brailer bucket system like the anchovy boats use in San Diego Bay to handle his fish so that none of the slime would be lost on the animals. They would then be carried into the tank system on an overhead rail which lifted the whole transport tank up and set it into the holding tank. A sluice system with dropping doors fore 'n' aft was going to be used to separate out the fish they wanted to handle. Then, a false botom was removed below the gate and the fish fell down into a tank below and was removed and therefore was never handled by a net prior to being used for experimental purposes. They had some aluminum tanks which were very nice and light and which were lined with fiberglass. These were being used as holding tanks in the laboratory and like all their holding tanks had a circular flow and central drain. We went over the entire hierarchy in the institution and found out much about their program.

We then spent some time talking with Gordon Pike, the whale authority, and he told us a good many things about the whales and dolphins of the area. He said that the killer whales were very common in the Alert Bay-Discovery Pass region which is towards the north end of Vancouver Island. They had been charting the white whale around the Island. He said that the young apparently were born in the spring of the year. The animals were here all year round but were more common during the time of the salmon run than any other. There is an airport which is capable of taking four engine planes near the north end of the island and could presumably take a plane used to haul such an animal from there and directly to the states. The airport was located adjacent to an old lumber pier which had a large boom used for lifting logs and a road running out onto the pier so that if animals were brought in on board a ship they could be lifted directly from the ship onto a truck and taken directly to the airport a short distance away. He also mentioned that the baby of the white killer whale was mottled in color and had been traced around the island with the adult. He stated that pilot whales were quite common but were a long ways offshore, one having been taken recently about a thousand miles offshore, apparently occupying the warmer water there. These were seen in conjunction with the whaling activities of the Cold Habor station. This station is taking finbacks, blues, humpacks. One right whale was taken this year puls many sei whales. He showed me an inlet towards the middle of the inside passage on Vancouver which had, according to him, quite a concentration of harbor porpoises. He said, however, that they were quite wary of boats and that they never seemed to go into very shallow water. He recommended, once again, that we talk to G. Clifford Carl of the Victoria Provincial Museum which we shall do day after tomorrow.

September 24, 1957

We started out this morning from Victoria and went to Port Sydney, got on the ferry and went out to San Juan Island. It was a most beautiful trip. At an island called Orcas we waited for several hours before we could get a transfer ferry to take us to Friday Harbor. We arrived at Friday Harbr in the late afternoon and went immediately to the marine laboratory of the University of Washington. There we met Harold Barnes from the Millport Lab of Scotland whom I have met earlier, and a couple of graduate students from the University of Washington. We asked a great many questions about the fauna from the students. They mentioned the following forms: they said that there were numerous sponges in the area but the sponges were very difficult to keep in captivity and

for some reason or other tended to break down after a while. There are a number of jelly fish which occur in the area, but most of these apparently are quite delicate and difficult to keep. The species which was being kept at Point Defiance Aquarium apparently is not very common. There is a species of sea anemone which occurs here (*Anthopleura* sp.), which is a large green form with pink-tipped tentacles and apparently quite common. Also the various forms of *Metridium* are common and supposed to be very hardy. There are some forms of the sand anemones which are available by dredging and apparently come up in considerable numbers. One of these is *Cerianthus* which can be obtained in this way and then there is also the true sand anemone. The sea pens are quite common and apparently keep very well according to the students. One fellow told us that the sea pens would live even though they were left lying on their sides for quite a long time. Normally they are in an upright position of part of their body buried in a mud burrow. There are a large number of different kinds of starfish available here, including our own *Pisaster* and some other ones which would be of no interest. Apparently the 21-ray star is very common here but this, of course, is of little interest because we can obtain it in Avila. The sea cucumber fauna is most interesting and apparently has a large number of forms which keep very well and some of which have very beautiful tentacles which they extend and leave extended most of the time. Some of these are bright red in color and others are bluish, etc. There are a large number of worms in this locality some of which apparently would make fine display material. This one species of *Nereus* (*N. brunius*) reaches a length of about four ft. and apparently will live for months at a time in the tanks here at Friday Harbor. There are polyclad flatworms living in this area, some of which reach six in. in length which would make an interesting display because of their mobility. The tubeworms apparently do very well and if the tubes are injured during the course of taking the animal they apparently regenerate these quickly. There are several species of these but the most showy is the one which is being shown at Pt. Defiance Aquarium. There are large numbers of nudibranchs available, but these apparently would be of little use to us because they are annuals and die off during the winter so that we would at best get half the season out of them. It seems like not enough considering the distance we are from home.

There is a very large crab fauna in this area and an equally large prawn fauna. The prawns apparently would be of little display use as most of them are very small. The crabs on the other hand include a species which would make fine display material; large decorator crabs, hermit crabs, and some of the large spider crabs in this area are quite brilliantly colored. Most of them are quite hardy in the aquarium. They apparently are able to keep octopus virtually indefinitely in the tanks. They keep them in a rather shallow tank not more than 10 in. deep and covered with a wooden cover so that the octopus can't get out. The octopus is virtually in the dark all the time. They obtain these intertidally by use of bluestone in the holes in which the octopus lives and they report large adults grow to 50 or 60 lbs. The smaller ones are preferred. There are several species of tunicates which might be interesting material. The sea lemon and the sea squirt and a transparent tunicate which clings to the walls of the tank are quite common. We took a tour around the salt water system of the station and found that it was set up very much like that of Pt. Defiance Aquarium. The water was sucked up through a pipe which was strapped to a pier piling. The difference between the two systems was that a large part of the Friday Harbor system is pyrex glass which has been painted with aluminum

paint to keep the algae from growing inside of it. There are sections of this system which are made of polyethelene tubing. There are two intakes, one of which comes in from the end of the Cantilever Pier. The water is sucked up inside of a rectangular tube that extends down into the water which rapidly becomes extremely deep in this particular location. The water is then run for about 200 yads to the aquariums in the laboratories. It is the only source in the laboratory used for chemical embryology. The other pumping system supplies some of the other laboratories used for animals which are not so sensitive. The valving of the system is accomplished by large-scale stopcocks just like the smaller laboratory kind. In places the pipe is run through a metal sheathing but for the most part is exposed completely. The joints—where there are joints—are couplings which are fitted with rubber gaskets. We did see some *Phocoenoides* on the way over—travelling very close to one of the islands off the San Juan (not the Shaw) group there. They were travelling very close along shore and we found out that this was apparently something of an unusual record; probably unusual only because people haven't looked.

September 25, 1957

We travelled from Friday Harbor to Victoria where we saw Dr. G. Clifford Carl, the Director of the Provincial Museum. We talked to Dr. Carl for some time about killer whales, trying to find out as much as he could tell us about these animals. We got rather a little information from him that we didn't already know. We found that the animals were very abundant and that they were abundant around Vancouver, but probably more so in the north though Dr. Carl didn't seem to know whether this was so or not. He told us that he had reports of the white killer whale all the way around the island and that he'd had one dubious report of its being accompanied by a smaller white offspring. He doubted it because he considered the whiteness to be recessive albinism, but of course it may not be, it might be merely a white pigmentation and not true albinism at all and therefore perhaps a dominant characteristic.

One bit of information we did get that seems valuable to me is that the young are born when they are somewhere around eight ft. long and thus we would have to prepare for catching an animal at least ten ft. and probably twelve ft. would be closer to the minimum size that we could expect to handle. He told us that the killer whale sometimes passed very close to shore at certain locations along the southern part of the peninsula, as a matter of fact near Sydney Harbor. They had been seen close enough to shore so that he thought a person could actually throw a net over the. This seems like pretty much of an off chance to me however and something that you could hardly wait for. He felt that if a person were to wait for the animals in a specific spot around the island that he could be pretty well assured of seeing them within a week. He felt that the best season of the year was during the summer and he didn't commit himself but he seemed to intimate that this was probably connected with the salmon runs around this time of year. He didn't know anything about the Campbell River locality and didn't have much to say about the northern localities such as Alert Bay and Discovery Passage. He said that he had had no records at all of killer whales having killed anyone any place in the world though there was rather a dubious record in China of a whaleboat having been apparently destroyed by the killer whales. One of the members thereafter disappeared, though nobody saw the killer whale take him. The museum itself had a lot of interesting material in it. However a good deal of it was falling into disrepair. Some of the animals were a little bit motley in

places, toes falling off grizzly bears. They had some rather badly done things on some of the fishes though we found much of interest to see there. I think that was about all we gathered from Dr. Carl. Unfortunately we missed Cleve Vandersluys at Friday Harbor, the skipper who collects for the Friday Harbor lab in the summer time and is a commercial fisherman during the rest of the year. He probably would have been a good source for us. Unfortunately he was out rescuing a couple of purse seiners at the time and we couldn't see him. We left the Provincial Museum and came across the straits of Juan de Fuca to Port Angelus.

September 26, 1957

We travelled from Port Angelus to Astoria and stopped—visited the fish cannery there. Other than that we accomplished nothing but traveling.

September 27, 1957

Leaving Astoria we quickly traveled to the Seaside Aquarium at Seaside, Oregon, which was run by Mr. Enser and his wife. Mr. Enser seems to know his business quite well and runs a rather nice little aquarium. It's located on the beach and sucks its water from the sand. For the most part it is on open circulation. However, when bad conditions set in, he can go on internal circulation. Most of his system is galvanized pipe but is being replaced with plastic pipe as pieces wear out. One of the major displays in the aquarium was the anemone exhibit which is the best by far that we have seen. The aquarium itself consists of a gift shop which is off to the side of the ticket booth and entrance to the aquarium. In other words you go past the ticket booth directly into the main aquarium room or to your right into the gift shop or to your left into the seal room. The main aquarium room itself is square and contains about 20 exhibits, including a couple of exhibits in the floor which were not particularly impressive to me. They were lighted by underwater light shining through a port.

One of the first exhibits that we saw was a small exhibit of sticklebacks in eelgrass. This was set in a small tank—I would say 10 gallons—which was viewed through a brass porthole which gave quite a nice effect. The metal was painted black but if it had been polished brass it would have been even more effective. The tanks around the walls were not especially large, I would say 400 or 500 gallons of water. He had a nice display of the wolf eels, including several adults which were pretty nasty looking. He had two octopus displays—a couple—one in the floor and one in the wall. He stated that he could never keep the octopus for any great length of time and he felt that they were sensitive to minor temperature changes both in the tank and during capture. He preferred capturing his octopus in his doghouses as he calls them, which are wooden boxes similar to our own, because he felt that the animals were less battered than they were in traps. The boxes were raised to the surface (they are about three ft. long as opposed to our four ft.) and they were dumped directly into a burlap sack which had been previously wetted and fit directly over the end of the box. If he had trouble getting an octopus out of the box he merely inserted the leg off of a 21-arm starfish into the box and the octopus soon vacated. Apparently they do not like to occupy the same box with the starfish. He mentioned that he caught most of his in a hundred feet of water or less and he also mentioned that during the summer when the surface water is warm to about 60 to 65 degrees that the octopus were very difficult to obtain and apparently had moved out of the area in which he was

used to trapping. While I think about it he mentioned that during the summer season when they had an unusually warm year, the water reaching about 65 deg. F., two or three examples of the white sea bass were obtained locally. He called them sea bass and from his description they sounded like white sea bass. The anemone display was mostly concentrated in one large corner tank which held about 400 gallons of water. The floor of the tank was covered with a nice rockwork foundation which went up as a series of shelves back up to the sides of the tank and into the corner, almost reaching the surface. On this were set perhaps 200 anemones of both *Metridium* and *Cribrina*, including both the colored *Metridium* and the white one. The tank was very brightly lit and each of the anemones was fed individually on pices of fish or crab, three times a week. He stated that they were fed individually from the end of a stick. He stated that the display was much better the next day after feeding. He fed his anemones in the evening. They opened up to their fullest extent on the following day. He felt that his display when we saw it was not fully expanded but that it would be the next day, but it looked pretty good to me the way it was. Other than these displays he had a few interesting small animals, some of which were misidentified, blenny eels and cottids of one kind and another, *Sebastodes*, etc. He had a very fine tank full of the 21-armed starfish which was made into a good display by the mere fact that he had probably 15 of these starfish in a single tank. In most of his tanks he had carefully put *Phyllospadix* plants which gave a very nice effect. One felt that he had tended his displays quite carefully and had tried to keep up the artistic side of it. I felt also, for a person who was presumably untrained, that his biology was about as good as any of the small aquariums that I'd run across. The seal display consisted of about six harbor seals, some of which were quite large. All of these harbor seals were trained to do various tricks, in order to entice a little food from you. For 15 cents you could get a bag of Columbia River smelt which held quite a fair amount of chopped fish. It wasn't messy. It didn't get too slimy on your hands and there was a dispenser for towels nearby so that you could wipe your hands off when you were done. There was a receptacle for the bag.

The little seals all did tricks of one sort or another for their food, and I thought put on a wonderful display. It was something that we could well do at Marineland. They raised such a ruckus when they were putting this display on that it was impossible not to laugh at them. Some of them would jump up and down on their stomachs on boards, making a tremendous racket as they slapped back down on the boards; others would clap their flippers or slap their sides. Some of the seals made a tremendous lot of racket by a sort of a constant braying noise. All in all, it was a very amusing exhibit and was itself worth the price of admission, I think. (The admssion was 50 cents for adults.)

Inside the aquarium space there was a tank which was I believe five- or six-sided. It had straight panes of glass and was made out of cement. In the center of this was a sort of rockwork pinnacle. At the time we looked at it, it had a series of dogfish swimming around in it. It seemed like it would be obviously a good sort of display tank for octopus for our second floor and as Frank suggested, would be fine if it were divided in two by a plate of glass so that two octopus could be kept and people could see them from all sides. I think we could design a fine tank along these lines. The gift shop was reasonably small, but seemed to hav a large selection of the usual junk that you find in gift shops. I felt that they were doing a good job. The Ensers seemed like very nice people to me and I think they will be visiting us soon. They had prepared a nice little guidebook for the aquarium which they sold for 35 cents. The color work was done on a three-color process and left

something to be desired but the layout of the book was simple and I thought quite effective. For the most part the information given in it was straightforward with no falsification at all. They had a nice series of postcards on the postcard rack, many of which were taken from pictures used in the guide book. These postcards were very attractive and I imagine would be good saleable items. They cost a nickel each.

Some of their harbor seals had given birth in the squarium. They had a display on the wall showing all the pennies and pieces of metal and keyrings, etc. that had been taken from the stomach of one of their animals that had died. This was, I think, kind of effective to keep people from throwing things in the tank. There were at least a hundred articles on this board.

We traveled down the coast from Seaside and as we went through DeLake, which is just south of Oceano Beach, we passed a thing called "The Oceanarium." It was closed. There were signs saying "whale" and "octopus." It looked about the size of the Seaside aquarium. Then we went on down the coast further in a fine wind storm. At Depoe Bay we stopped and went in the aquarium there. This aquarium is run by Mrs. Palmer and was in rather sad shape. She had a sign up outside saying that over a million people had gone through it. Probably a million people had been cheated out of their 35 cents admission. The aquarium itself consisted of a series of 20 small tanks most of which were viewed through circular glasses. A good many of the animals were dead. The place was extremely dark and there was no worthwhile display in the whole place as far as I could see. The water was extremely dirty in some of the tanks. There was a central section. One walked through a single corridor around the central section, which also had tanks in it. Their anemone tank was very cloudy but if it had been clear it would have been a good display, but not as good as that at Seaside. One tank which might be of some utility to us was a tank in which you could look on top of the water. There was a hole in the wall which extended back into sort of a cavern and you could look as if you were looking into the top of a tidepool. It appears to me that such a design might be useful to us if you could also look underneath the water at the same time, in other words, have part of the front of this tank made of glass so that you would have the effect of looking at the top of the tidepool and also seeing a cross-section of it at the same time. From there we continued on our way and are now at Roseberg, Oregon. Tomorrow we hope to make a stop and jump to Steinhart Aquarium and home.

Letters from Hawaii

1959

Dear Phylly,

I miss you and wish you all could be with me. I'm sitting in the dockside installation of the U.S. Fish and Wildlife Service at Kewalo Basin in Honolulu. Our unit is perking along nicely just outside the door. A little three-year-old Japanese girl named Diane has been helping me type. She is the daughter of one of the staff. She doesn't type very well but likes it a lot.

The trip over was pretty uneventful. We could feel the weather getting warmer, day by day as we cruised along. The California current was pretty evident by water

temperature alone and by the swell and wind. Once outside it the water began to warm and finally reached 81 degrees. The fish came through fine, after an initial loss of most of the last load we took to Puddingstone. The ship scarcely rolled at all and I never had the slightest touch of seasickness. We ate with the passengers and Captain and all that. The food was endlessly plentiful and very good. I am afraid that we usually did little more than read, sleep, peer at the fish, and eat.

Once we began to enter the central Pacific water mass we came into the thunderheads and squalls of the tropic seas. There was virtually no life at all to see, except a few flying fish. Boots and I made friends with the mess cooks and listened to the ball games in their room. We got clued in on the sailors' viewpoint. Just as in the Navy they lead an incredibly tedious life.

We came to the islands in the dark and passed Diamond Head just after dawn. We shut the water off and went in with the tank on internal circulation to keep out the harbor water. It didn't take too long to get the containers off the deck (they are big semi-trailers that come off their wheels) and then us. We boarded an incredibly beat-up semi-trailer and towed the critter to Kewalo Basin, where I am now. It is a nice corrugated iron laboratory set on a coral fill peninsula.

We have the open ocean on one side and the basin filled with trap boats and skipjack boats on the other. The boats come right past the door into the cannery. There is a wonderful little hole-in-the-wall restaurant about 200 yards away that serves about a square foot of rib steak for \$1.50 with soup and salad and all the fixings. We are temporarily holed up on board the Fish and Game vessel *Makua*, in nice bunks with the water lapping at the hull. We spent one night at the Princess Kaiulani and moved out post-haste. It was too fancy for fishermen and we felt like crumbs crossing the lobby in our dirty clothes. I'm not sure where we will finally end up, perhaps on the lab floor. So far there has been little time for sightseeing. Boots and I did wander around in the main drag of Waikiki wishing we had wives along. We peered at the sands of Waikiki pondering whether or not to take a handful up to put in Frank's bed, but we desisted. We wandered around in the gardens along the edge of the Royal Hawaiian and Moana hotels. Absolutely beautiful with dense thickets of Ti plants and phyllodendrons and god knows what else. There were big coconut palms and banyan trees with aerial roots as big around as a man.

Our plans for the coming days are pretty hectic. We will probably finish fresh-water acclimation of the shad tomorrow and start planting on Monday on Oahu. We will take the critters to three localities here. Then we load shad onto the *Makua* and set out at dark for Maui (Kahalui harbor) and reach the island at dawn. We will then plant there and return to Molokai to fish. We will probably use hand lines and such for our specimens. Then we will come in and work the trap boats for a while.

We might even get a Hoki-Lau thrown for us. This is a communal event in which the natives tie palm fronds to a line and go way out over the reefs and come in, driving the fish before them. Apparently this is thought of as great sport and the natives do it just for fun.

Our return date is up in the air now. We probably will not get aboard the *Hawaiian Rancher* which leaves here on the 13th and gets in about the 21st, but will probabl come in on the 28th on the *Hawaiian Builder*. This is because we got a bum steer from Matson in Wilmington and didn't get on the roster soon enough. At any rate the

boat will hit either Kauai or Maui on the return trip, plus Hilo on the Big Island. We will not have much time in either port but enough to say we have been there anyway.

You know Phylly, I take a look up at the hills now and then, and think, if only my family were here I would take a little time out and just look at it, but when you're along, or with a couple of guys, you just go on working. There is a dense mass of clouds that hangs over the high peaks and must rain almost constantly on them. These mountains are precipitous and covered with a dense jungle of vines and trees. The trees are beautiful everywhere. It distinguishes the place. Mimosas, monkey pods, koas, and so on. It really is a very lovely place and everybody dresses most casually. It is hard to tell a pregnant woman from everybody else since most are wearing muumuus. These grow on you and I now think they look pretty nice (in contrast to my former attitude that they were absolutely awful).

Well, I guess that is about all. I will walk down the dock and go aboard the *Makua* and crawl into the bunk. It is too warm to get covered up. I hope all goes well with all of you. Susie, Nancy, Barbara, and Little Dickie, you and Mom. Please give them all a kiss for me. Tell them I saw a big lion today in the store window but that I didn't buy him because I have some other things picked out.

I hope Bets got off OK . . .

I love you very very much Phylly and wish I could give you a great big hug and a kiss right now.

Ken

1959

Dear Pop,

I'm sitting in the U.S. Fish and Wildlife Dockside laboratory after a hard day of sightseeing. Our tank is set up outside on a decrepit old semi-trailer and the shad are cruising happily within. We have lost very few since a rather severe loss on the first day while we were still tied to the Wilmington dock. I guess we still have 2,500-3,000 fish in the tank, which should be plenty to stock the islands. The initial plant in the Colorado River was 55 fish and the species is widespread now.

Frank and Boots and I went swimming on Waikiki today (warm, very salty, and the bottom covered with coral hunks but still very nice), drove around past Diamond Head after looking at the Aquarium and on around the rugged volcanic coast to Kaneohe Bay and the over the Nuau Pali and back to the station. We had a nice Chinese dinner at Wo Fat's and came back again.

On Monday we begin our planting on Oahu Island. We will make two, one in a big, shallow lake and the other in a reservoir up in the hills. Then we load the Fish and Game vessel *Makua* with fish and sail for Maui. We will arrive after about a 12-hour run and take the fish up the island to some lake or other. Then we turn around and head for Molokai where we will fish for specimens, using handlines mostly, I believe. After that, things are pretty uncertain but I think we will not leave until the 18th of September.

The weather is a bit muggy but far from oppressive. We get a few showers but nobody pays any attention to them. The top of the mountain seems always cloud-shrouded however and I think it must be pouring down up there almost all the time.

The Mafia are having a fine time. They have poked into the construction of all the Hawaiian boats and criticized the fishing methods and unloading techniques plus the

general sloth of our associates (they do this everywhere) . . . All in all they are having a fine time and soaking up culture with every pore.

We have peered at many of the fish they get here. There are some really nice kinds that should pep up the Marineland display a lot I think. I just hope that John Prescott can sell the management on giving us a new wreck for the tank to provide refuges. If not we will undoubtedly lose a lot of them.

I hope everything is going well with you and with the Portuguese Bend contingent. Phylly will miss having Bets around to help with the kids. Mom should take up some of the slack but I hope she doesn't try to do too much.

Drop me a line if you get around to it. Oh, by the way, the first mate on the ship coming across was an old timer at Catalina and knew Holder and Jimmie Jump and worked with Farnsworth and the others. Quite a fascinating guy.

See you about the end of September,
Ken

September 1, 1959

Dear Mom,

I guess you will get this a couple of days after your birthday, but at any rate I am typing it on September 1. I hope you have a proper birthday celebration. It is really worth having them just to watch the kids. They seem to have as good a time on other people's birthdays as on their own. I have a goody picked out for you but you will have to wait until I come home.

Tomorrow is the big day here. We plant our first shad in the ponds of Oahu. This of course is the culmination of the whole effort on the way out. Thus far the fish seem to be in fine shape and I am confident that we will do a successful job. Then, in the afternoon we will load the Fish & Game vessel with fish and leave for Maui. The trip will take about 12 hours. We land at Kahalui and take the fish up the mountain to a couple of other lakes. Then we come down and leave for Molokai. The boat will stop while all hands fish for us. We hope to gather a good amount of various kinds of large fish for our tank.

Today we went out to the Waikiki Aquarium and looked around while we waited for the director. He didn't show up so we went over to the zoo to look up my friend Paul Breese. Paul and his wife took us out in Kaneohe Bay in their boat for a dive and swim over his own private reef. When I say private, it is just a spot he knows and frequents. The bay is a really spectacularly beautiful spot. Fluted, almost vertical cliffs rise to a knife-edge ridge back of the bay. All are covered by green trees, vines, mosses, and ferns. The bay is large and almost enclosed by islands and reefs. We wound around through channels in the reef past some beautiful houses set right at the water's edge and out into open water. We crossed over to a verdant paradise of an island called "Coconut Island." It is the site of the University of Hawaii marine lab. It is a low island covered with palms and trees. We entered a narrows out through the trees and entered a long, perfectly calm lagoon. The station is arranged along one bank, with a little dock, machine shop, labs, eating halls, and animal houses. All the buildings are low, white-frame construction with wide verandas and half-screen walls. Tanks of marine animals are set up along a boardwalk in front under the shade, while others are held in screen boxes hung along a float. We cruised up the lagoon looking at the little minnows being chased by barracudas.

Back out in the bay we circled the island and beat up wind into a choppy sea to a shallow reef that comes just out of water at low tide. We dove there. I had never really looked at a live reef before. The color of this particular reef was rather drab—browns, whites, and an occasional spot of color. But the animals are spectacular. I saw at least 40 species of tropical fish, many of brilliant colors—moorish idols, damselfish, angel fish, wrasses, and so on. The invertebrates were just as interesting. Delicate feather-like hydroids took the places of algae. Strange sea cucumbers were very common. They were red or pink and filled with water. If you lifted them out of water they drained down just to water level and refilled if you lowered them. Their body walls were transparent and they had a feathery plume of tentacles at one end. Another species exudes a string of sticky material when annoyed. These strings are so adhesive that they literally pull your skin up when you try to remove them. Mushroom corals were everywhere. The water was about 80 degrees, I would guess.

Well, we are packing up now for the voyage so I will sign off for the time, wish you a happy birthday, and get to work. My love to all of you gals (and Richard). I miss you and will certainly be glad to see you.

Love,
Ken

Dear Phylly,

Just a quick note before we go out to sea. We are leaving in a few minutes for the fabled islands of Kauai and Niihau. The latter is the island which everybody is forbidden to land upon. We will fish there as it is reputed to be the best fishing in all the islands. Our collection grows but in halting jumps. We get a load and then lose a lot of them. I hope we will make it for good this time as we are now using a big receiver which we just lowered in the bay.

Your letters are wonderful but I suspect some of them have been sent back to you inadvertently since they got a new mail clerk here and she stopped all our mail for a while.

All my love to you, sweetie. It will be wonderful to get home and see all my family again. I have lots to tell by now.

Love,
Ken

September 5, 1959

Dear Phylly,

We have just come in from a four-day trip on board the Fish and Game vessel *Makua*. The trip was a wonderful one and quite successful from the fish standpoint. We caught 230 fish—all on hook and line. This amount included a lot of very pretty critters. There were several kinds of triggers, wahoos, jacks, wrasses, and so on. Probably the most brilliant are the moanas or goatfish that are really gaudy.

I guess I will just start with a day-by-day account of my doings since I last wrote. We were scheduled to leave for Maui with the shad in the *Makua*'s bait well, having talked the powers that be out of sending the whole unit over on a barge. The boat left on Monday evening, but I had been invited over to some friends of Paul Breese's for dinner, so I planned to stay and fly to Maui and meet the boat. Frank and Boots accompanied the

fish. This proved to be a sage maneuver as things turned out, since it was a horribly rough trip with water crashing over the railings and the ship rolling and bucking for several hours. The channels between the island are very rough as a usual thing, I think because the land funnels the wind and speeds it up. I went out to Kaneohe Bay with Paul (the zoo director and an old crony of Charlie Shaw's). His friend, who is a shark authority, lives way out in the sticks, down a dirt road, past two taro fields and a couple of caraboos [sp?] and right at the water's edge. He has a grass-plaited luau house and a modern frame house. It is quite a place, with no apparent neighbors and only the lapping waters of the bay and the trees and stars to keep you company. About half a mile behind the place the huge, fluted cliffs of the Koolau range rise.

When we arrived, dinner was spread out on a plaited matting in the grass house on Ti leaves. We had a lot of exotic goodies that I can scarcely remember, such as Lomi Lomi salmon and such—all eaten with the hands, and very good too. The company consisted of some students from nearby Coconut Island, the host and hostess (she is Philip Wylie's daughter), and a wonderful old Hawaiian lady who knew nearly every song written including both Hawaiian, Tahitian, Cowboy, and so on. We had quite a song fest. I wished many times that you could have been with me. The affair didn't last too long. We peered at the geckos crawling around the house, plus the tame Hawaiian owl.

Paul and wife and I went up to their house and thence to bed. I didn't sleep much though because it was hot and the mosquitos were thick and the combination kept me thoroughly uncomfortable. Paul took me to the airport at 7:00 and I boarded an Aloha Airlines plane that cruised out over Oahu and dropped down on Molokai to a little field. Molokai is largely uninhabited or farmed. There are only about 5,000 people on it all told. Much is rugged volcanic mountains ending at precipitous cliffs. We cruised along over the sea just out from these cliffs and directly over the leper colony there. It is a little settlement nestled on a fan-like lava flow which spreads out from the base of these cliffs into the sea. The peninsula is backed by vertical walls nearly everywhere. We could see a burro trail descending the cliff in a series of switchbacks. There is a little hospital, churches, houses, a small landing field, a couple of roads, and a lighthouse in the colony. Beyond the colony the coast is even more rugged. Great steep-walled canyons lead up to abrupt faces that usually had waterfalls pouring over them.

We then came to Maui. This island is composed of two very high, rugged mountains separated by a saddle-shaped plain. One of the mountains is Haleakela, a great 10,000-foot volcanic peak that is part of Hawaii National Park. We cruised over the checkerboard of farms and landed at Kahalui Airport, where we were met by a Fish & Game truck and taken to the dock, where the *Makua* was waiting. Frank and Boots were absolutely shot from having been up all night tending the shad. The fish were in excellent shape and we began preparations for the planting.

A nice fellow who was in charge of heavy equipment for the C&H Sugar plantation escorted us up to the planting site at a reservoir on the plantation grounds. On the way he gave us a lot of information about the art of sugar raising. The plantation is one of the largest in the world, encompassing 640,000 acres. They have their own schools, shops, stores, foundries, and so on. He had 135 pieces of heavy equipment to care for. This included such things as 65-ton carry-alls that are packed full of cane and driven to the refinery. The sugar is brought down to what we would call brown sugar and then shipped to Crockett, California for the final processing. They even run their power

plant on the stalks that remain after pressing and have enough power to supply all of Maui during the refining season. It is hard to picture the huge size of this operation. They even have their own railway.

We drove up through the plantation onto the side of Haleakela to a nice pond all set about with trees that looked like mesquite. They run large numbers of black angus cattle above the cane fields and these were milling around. We put the fish in with little trouble and lost about 6 out of 1,500. The only plant that has been poor to date was not made by us but by Fish & Game by air to Kauai. The threadfin operation has been highly successful and are we glad that it is over. The only trouble is that it is supplanted by hauling live aquarium fish back, which is worse in many ways.

Once we finished the plant we went back to the ship and Pete Wilson plopped us all in his car and we drove off to see Haleakela. It is about 25 miles to the top. First you pass through cane fields, and then grassland dotted with groves of eucalyptus and then up into lava floes heavily vegetated with low bushes and finally out onto the crest at 10,000 ft. The crater is immense. A 1,000-ft. cinder cone looks like an anthill inside the crater. There are several of these cinder cones down deep inside the main crater. In two places the lava poured through the crater wall and ran like a vast glob of molasses down to the sea. The crater of course is dead now, but you can imagine what it once was.

We could look out over the sea and look at the surrounding islands. Mostly they were covered with cloudbanks. We drove back down peering at pheasants and chukkar partridges along the road. Back at the boat we watched an aku boat unload (skipjack tuna). It is a most primitive operation by our standards but the fish are in A-1 shape.

Pete wanted to take a run over to a village called Lahina, on the other side of the saddle. Boots and I jumped at the chance, fagged as we were by this time. We arrived just at dusk, giving us time to wander around a little. It is a charming place. Once it was the capital of the islands when it was a whaling port. Evidences of whaling activity could be seen in the form of old rendering pots and other such gear. They had a grand old hotel called the Pioneer, complete with veranda, swinging doors, and a fine old-fashioned bar with wicker furniture . . . completely charming. We'll have to stay there when you come to the islands with me. We were looking for the crew of a tuna boat and wandered across town. The center of town is occupied by one huge banyan tree. The single tree covers a city block. Dozens of aerial roots descend into the ground to support the spreading limbs. Some of these roots are as big around as a man, or more. We met a couple of ex-patriate divers who were eking out a living diving for the black coral that our Carmel artist was using for his jewelry. Pete decided to stay on the boat and left us with the car (which he had borrowed) to get back to Kahalui as best we could in the dark. We made it but not without a few deviations in the dark.

Next morning we left port at about 2:00 A.M. for Molokai and our fishing attempts. It was bright dawn when we passed the end of the island and up along the cliffed coast. One canyon in particular seemed unbelievably beautiful to me. It was a U-shaped gorge ending about a mile inland at a 1,000-ft. sheer cliff. The canyon was choked with trees, and taro patches and such, and up over the cliff plugged a waterfall as large as Yosemite Falls. Fabulous . . .

We finally began our fishing activity in earnest at Kalaupapa (the leper colony). What a lonely and isolated spot it is. The sheer cliffs lock it behind and the rugged lava coast against the sea. The tradewind-whipped seas crash in relentlessly sending plumes of

spray up into the wind. We drifted in what lee there was, droplining with considerable success. We caught lots of goatfish and wrasses and such. Most everything had to be punctured with the needle to deflate the gas pressure that builds up when the fish are hoisted from deep water.

The men on board, Georges Gilbert (the skipper), Sam, Carl, and Richard, were wonderful fun. Georges is an islander who has never left the islands. He is a smart and happy man who is always singing something. In some ways he is an unsophisticated childlike man, which is greatly refreshing. For instance he thought nothing of singing us a little song about canning pineapples that he had written in his grammar school class.

The others were biologists with the territorial Fish & Game or crewmen. Sam, the crewman, is a peppery little Japanese man. He is an oldtimer in the tuna long-line industry. Carl, a very intelligent Japanese biologist with Fish & Game, and Richard, a rather sleepy Japanese working on the tilapia project (a fish they are also trying to develop for tuna bait).

We caught some Kona crabs on funny square-mesh crab traps. It is undoubtedly the most delicious crab I have ever eaten. Sweet, wonderfully textured flesh.

Next morning we cruised down along Molokai to the west end. We made an attempt to catch ulua, which are big jacks, but failed. We also set the gill nets and I went ashore with Georges to try for seargent majors. We landed on a beautiful lava reef. The pools are superb and filled with all kinds of wonderful critters. I saw many little 1-2 in. butterfly fishes that normally cost \$10 each in our stores. I had a little bamboo pole with a length of leader and a single hook. The trick was to drop the bait into the swirling water as it poured over the boulders white and foamy. It was great sport catching all kinds of strange critters while creeping over the rocks. I got thoroughly soaked with one wave that crashed on the rocks in front of me.

After staying in this cove for the night, we crossed the channel and made for Oahu. Flying fish were everywhere—ones with pink wings and ones with clear wings and little ones like bumblebees. We saw a few porpoises that are much like our common dolphins and then entered the harbor. Frank and Boots and I then worked like demons until almost midnight getting the fish off and into the storage tank. It was back-breaking work carrying all the fish in big buckets and garbage cans.

That's about where we are now . . . the fish are piling up from trap fishermen and our catch and other sources. I think we will have a nice load without too violent an effort. One thing about this fish transporting stuff . . . there is never really a time when you can really take it easy.

Well, this letter is being written in pieces and hunks here and there. We just returned from having dinner up at Tinker's house. It was fun. He has a nice house with pandanus (hala) trees in the backyard, plus frangipani and mango trees too. I had a couple of rousing pingpong games.

Your letters were wonderful, Phylly. I could see our little daughter all covered with beet juice and hear Richard howling. Oh my, it must grate on your nerves but it carries all the sounds of home to me and seems very wonderful. There is nothing like being busy to combat loneliness, but sometimes it breaks through pretty hard anyway—usually when I am doing something I would like to share with you. I love you awfully much and want to be with you and the whole clan. I imagine it will get pretty hard to take

about two days out to sea. Right now I can swat mosquitos and wait stoically to go home, but it is far enough off so I unconsciously take it in stride for the moment.

All my love to you sweetie and give the whole crew a kiss from Daddy and tell them where it came from.

Ken

Save my letters Phylly, I want to compose field notes from them.

September 14,

1959

Dearest Phylly,

We just came in from Niihau and I was greeted by a fine lot of letters. Most appreciated too. It is great to hear all the little goings on at home. I wish I could have witnessed the first day at school for Susie. She must be pretty darned grown up, and I can imagine how you felt with her traipsing off into her own private school world. Well, it will be fun to sit back and see what happens now.

I will know definitely tomorrow, but it looks now as if we will be boarding the *Rancher* on Saturday the 19th and coming directly home, instead of the later *Builder*. There were some cancellations and we may get aboard. This will be wonderful as the *Builder* has been delayed a couple of more days and I want to get this show on the road and get home to my family and to get the critters off my hands and into the tanks.

I guess I should give you a day-by-day chronicle of the Niihau trip. It was an interesting one. We left the basin at noon and cruised out into the channel. Kauai is nearly 100 miles up the line and could not be seen for a long time. We had a following sea and thus a pretty smooth ride. Sometime early in the morning we changed course away from Kauai for Niihau. When I went on watch at 4 AM we were cruising down the high cliffs of the windward shore of this "forbidden" island. As you may know, it is owned by one man, a Mr. Robertson. He also owns about half of Kauai. He is a very religious person and has sought to protect the natives of Niihau from the corruption of the outside world. If a native leaves without permission he may not return, and no outsider is supposed to land.

About dawn we rounded the cape of the island, past a big cinder cone, and started up the leeward side. We set our crab nets out in deep water offshore. These are discs of netting in which the crabs become tangled when they try to walk over to the bait secured in the middle. Once this was done we went in closer to shore and began hook and line fishing. Georges emptied a catsup bottle and used it as a float for an ulua line. This is a big jack that we wanted very badly to catch. He baited a most venomous looking hook with a live goatfish and tossed it out. During the course of the trip we took six ulua with the gear. They are among our nicest fish. Our hook and lining produced a fair number of nice fish, mostly the same kinds we had taken earlier at Molokai. The boys loaded the skiff with nets and tanks to make a set inshore for large reef fish. The net was set in a semi-circle with the ends against the shoreline. The men then dove and chased the fish toward the net. A few would get entangled and then be taken out by a diver and handed up into the boat. Georges, the Hawaiian, French, and Irish skipper, was hit by the tail spines of a big kala (unicorn fish) and was ripped on one finger almost to the bone. The hand was patched up while I went into help retrieve the net. I wore my face plate while

Fuji, a taciturn but wonderfully efficient Japanese fellow, dove with the aqualung. I hovered above him to untangle the net from the diving rig as the surge swept it back and forth. Inches at a time the net came in. It had to be untangled from each piece of coral in this fashion. I guess it took us three hours on the single set.

We were anchored off Nonopapa, which is a cattle loading station with a big barn set under large aljiroba trees. These look like big mesquites and cover the island. The island is marked by a large row of volcanic cliffs that slope down to a rolling grassy prairie that supports a couple of large brackish ponds and finally ends at the other extreme of the island in the cinder cone we had rounded the day earlier. Niihau is largely a cattle ranch, but they also run sheep and goats and raise some food plants of one kind or another. It is lower and more arid than the other islands, except for rocky, barren Kahoolawe.

After a wonderful meal cooked by the abrupt little first mate, Sam, we went back to hook-and-lining for night fish. We caught a lot of mempaches and little cardinal fish. In the evening, after the fishing had slackened, Georges hauled out his ukulele and sang Hawaiian songs. He has a fine tenor voice and knows and can translate many of the local songs. It was great fun and we ended up with an orchestra of pots and pans and stove lids, plus the uke.

September 10, 1959

We were up early and inspected the crab traps for the second time. This time we brought up a dozen and a half of the wonderful critters. On our way we were accompanied by a school of 15 or so big *Tursiops*. They ran the bow wonderfully well, and as well as we could determine, were identical with our California species. Then, later in the day, we saw some small, slender porpoises in close to shore. Much to our surprise they started jumping into the air. We saw tiny ones of no more than 25 lbs., up to adults of 125-150 lbs., leap into the air and spin like tops before hitting the surface again. One even did a one-and-a-half flip while spinning on his long axis. They look like a small *Delphinus* but are slimmer with a longer snout, are smaller and swim slower and much closer to shore than our *D. bairdi*.

We had talked with some other fishermen in a sampan and they told us to go up to the end of the island for our netting and hook and line. So we started up along the coast, past long coral beaches as clean and vacant as if no one had ever walked them. All through our journeys along the coast we were followed by a rickety old stake truck or by horsemen racing through the grassy fields watching us. Finally, after an hour's run we reached a little rocky cove near Lehua Island. The truck on shore was there to greet us and we could see the natives beckoning us ashore. Fuji, Frank, Boots, and I decided to make a set at this place and rowed in. Fuji and I put on our diving gear and plowed ashore. The natives had nothing particular to say but just wanted to talk to strangers. They were dark skinned and all but one had the dark hair of the Polynesians. The one was red haired. All were childlike in their simplicity and knowledge of the outside world. They were dressed in jeans and dusty shirts and hats. One that looked a little like a dusky Milton Berle knew a little English. He didn't know what "cow" meant but understood when Fuji called cows "Pipi," which is the Hawaiian word. They didn't know what I meant by California, but vaguely understood "Cahlifornie." Of course they didn't know what an aquarium was. Milton Berle had a transistor radio under his arm and was

miraculously and incongruously listening to the Dow-Jones Stock Quotations. He was probably Niihau's industrialist. We found that there are 21 registered voters on the island and they vote absolutely solid Republican, all other parties being sinful I should imagine.

We pushed off through the surf and cruised over the bottom. I picked up a sea cucumber and tossed it to the laughing natives on the shore.

The undersea shelf was rifted with deep canyons studded with corals. All kinds of beautiful fishes cruised about. We saw big kalas with their vicious spined tails, pretty black-and-red tangs, butterflys, and many pretty wrasses. We set the net across one of these rocky flats and began chasing the fish into it as best we could. We sought the fish out and actively herded them toward the net. Most of our catch was tangled where the net had been hooked up against a rocky reef. Amongst other fish, we took one big, beautiful, jade-green-and-pink parrot fish of about 15 lbs. Frank and Boots took our catch back to the boat with the outboard while Fuji and I tried to drive more fish in. Then came the tedious task of bringing the net up. The bottom was criss-crossed with channels like those of a maze, dug by sea urchins. The net caught on the ridges and tangled in the coral. By the time it was up we were both puffing a little, though Fuji much less than I.

At the boat we found Sam fishing away. He is Japanese, about five ft. tall, and full of pepper, but great fun. He loves to come up and say, "Hey you, give me you line, I'll show you how to catch fish." And then he proves it. One time Fuji was sleeping in the galley and Sam went up to him and shook him. Fuji mumbled something incoherent and Sam shouted "Shut-a-up you," and then walked off laughing. Sam had caught about 12 humu humu ele eles (black black trigger fish). I tried and caught 3 in a couple of hours while he caught 12 more. Finally he showed me his gear with little leaders and hooks and I began to catch then too.

The others went out to make some more sets. Georges had encased his finger in the halves of a bamboo pole split lengthwise. There was not room for everyone in the skiff so I stayed on the boat and fished. The boys made three sets and got virtually nothing for their pains but extreme fatigue. I loaded the tank with humu humu ele eles.

That evening we cruised up to Lehua Island. It is a tall cinder cone that juts up from the sea a short distance offshore from the main island. We tried to anchor but the anchor dragged free and fell into deep water while we drifted. So Georges turned the ship down the coast again and we dropped anchor again off Nonopapa.

September 11:

Up at dawn and off for the crab traps. This time they were not to be found. Fresh trade winds had come up and the sea was a mass of white caps. We took our bearings and could not find the buoys. Finally we gave up and shortly came upon the floating line and one buoy. The evidence suggested that sharks had taken the traps and line, clipping the latter loose and stealing the crabs.

We went back in to Nonopapa and made another set in a tiny little protected cove. After much effort, in which I put an aqualung on to retrieve the net, we caught a few nice kalas and other fish. What is tantalizing was to see the myriads of beautiful fish that we could not take. After the set I beached myself and picked up a piece of Niihau rock to put in my garden, along with rocks from other islands we have visited. We picked up a load of slate pencil urchin sand went back to the ship.

The ship then turned up the coast and made for Kauai, flight after flight of flying fish spraying away from the bow as we cut along.

We reached Kauai a little after noon. Georges called a friend of his, Hoppy O'Neil, and borrowed a car while the ship put on water. We were to take a brief trip up to the high mountains of central Kauai. We cut up through cane fields and into the Aljiroba forests and then into eucalyptus groves and finally into the native forest itself. It is composed mostly of chia trees, which bear the flower called lehua. If you pick the lehua blossom it is supposed to cause a storm to come. We didn't pick any but could see the devastation wrought by Hurricane Dot where she passed through the forest. The other common tree is the koa, with long, sickle-shaped leaves. Soon we came out into a pretty series of meadows set amongst the forest trees. At 4,000 ft. it was cool and quiet. We saw wild pigs rooting in the grass at the edges of the clearings, jungle fowl called here and there, and quail and pheasants were common. This was Kokee, a vacation spot for islanders, and a lovely one too. On up we went and finally came to a promontory that overlooked one of the most beautiful places I have ever seen. It is called the Kalalau Valley and is a great amphitheatre of fluted and carved palis dropping from 4,000 ft. down to the sea, almost in a single leap. Here and there, knife-edge ridges stand up a thousand or more ft. that are so thin, even at their bases that they looked like one could poke a hole in them with a stick. It would be utterly impossible to climb them and there would be no place to stand if you did scale to the top. The valley below was choked with verdure—trees and vines and palms. Off across the valley a white waterfall plunged 2,000 ft. or more in two leaps. One man lives in the valley. He is an ascetic negro physician, who a la Thoreau is living off the land and writing a philosophical book there. He lives in a cave and can be reached only by a tortuous trail that winds up from the sea, through the jungle and under the waterfall to his cave. He lives on guavas, passionfruits, papayas, taro, and fish and goats when he can get them.

Back down the slope we visited the beautiful and majestic Waimea Valley—the so-called Grand Canyon of Hawaii. It looks much like the Grand Canyon though it is probably only a third as deep. Then we wandered in the forest and Georges picked some of the vines and plants used in making leis. The vines are carefully picked and stripped. The species used to have the finest woodsy smell. The forest was full of plants that we see only in our greenhouses. Ti plants, tall hala or pandanus trees, and so on.

We drove on down the valley to Hanapepe where we ate dinner and thence back to the ship after dark. It had been a memorable trip to a really sainted spot.

September 12:

Next morning we weighed anchor from Port Allen and made for Oahu, this time into the sea. The weather forecast said we were to have moderate to fresh trades. This means winds up to 30 knots and great spume-capped rollers. The boat pitched and bucked along at a snail's pace of about 6 knots. Sometimes we took spray and whitewater clear over the superstructure, but amazingly enough I didn't get seasick. In fact I haven't been sick the entire jaunt for some inexplicable reason.

Halfway across the channel we came upon a floating board and caught two dolphins. We made port at 9PM and secured everything and went to bed.

Well, Phylly, after that we unloaded and checked our fish and worried over the things that had happened in our absence. We had lost a lot of fish and pumps had jammed and people hadn't taken enough care. I guess it is too much to expect anyone to supply the vigilance it takes to bring these critters back except us.

We now have a lot of fish in the big tank being treated for bugs. It is a touchy time as they have to go on internal circulation for a couple of days.

Tomorrow I try to make arrangements for the homecoming plus the final fish round-up from various sources. We will all be glad when it is over and we can put our unit on the boat and come home. I want to see my family all . . . proud little Susy, Pixie Nancy, and sweet little Barby, plus squally Richard, and long suffering patient Mom . . . but you I want to hug and kiss more than anyone sweetie. I miss you all very much.

All my love,
Ken

Sawfish Trip
February 23-March 12, 1960

February 23

Don Hackett and I roused ourselves at 3:00 AM, and my wife Phyl drove us down to Marineland. With little ado, we climbed into the big 5-ton truck and started off in search of sawfish, which we planned to catch some 1,700 miles away in San Blas, Nayarit, Mexico. At San Pedro we found the other two members of our party, Frank Brocato and Frank Calandrino, waiting in their pick-up as we lumbered up. Then off through the night. Neither Don nor I had ever driven a rig such as we were doing now. In fact, I had recently been driving a little Volkswagen, and there was some difference, to say the least. The truck had 15 speeds forward and three in reverse, so we drove with exceeding caution, feeling out the braking and learning how much space we needed to turn and pass. The big 2,000-gallon tank on the bed put quite a load on the truck but she took it well. Once we were on the open road we found we could cruise along at 45 without much effort, and providing we gave ourselves plenty of room to stop, it was safe enough. Certainly we felt impressive sitting up in the cab looking down at everybody below. Volkswagens were positively things to be scorned as it was obvious that the truck could roll right over one and crack it like an egg.

Dawn broke as we started into the San Geronio Pass and we rolled along without event to Yuma. There we found we had to license the big truck to pass through Arizona, at a cost of \$15.50. Toward afternoon Don and I began to feel like "rig pushers" except that we clashed an occasional gear here and there. The other truck drivers recognized our exalted status by waving a nonchalant hand at us as we went by. By the time we stopped at Gila Bend the cold night air of the desert closed in and we were glad to park our gear and take a nice comfortable room for the night.

February 24, 1960

An uneventful day's driving to Tucson. We visited the Arizona-Sonora Desert Museum briefly to look at their new small tank displays. They have done a marvelous job with fiberglass, producing simulated granite, sandstone, and porphyry that is indistinguishable from the real thing. My only complaint—the tanks lack color.

February 25, 1960

Left Tucson early and rolled into Nogales before noon to begin battle with the border officials. Little did we know what a battle it was to be. These border towns are not only unsavory places for the most part but also centers of the red tape industry as well as the mordida or greased-palm industry. Whole fleets of Mexicans survive on what they can con out of the American tourists. Our passage through American customs was brief and easy. We were advised to handle our Mexican problems through a broker and I sought out a Mr. Carlos Miller Ojeda, who had been recommended as an honest man, which he certainly proved to be. He ushered me through several departments and we were soon on our way to the southern check point just south of Nogales. There all was going well with swarms of inspectors crawling over our baggage looking for ways of menacing us into thinking we would never get through unless a few bills were appropriately passed.

Then one particularly official gentleman in military clothes sporting a sign "Celador" asked how big our truck was. "Five tons," I replied. He arched his brows and shambled in to phone the Chief of Customs, a Mr. Sanchez. Since we were classed as tourists Mr. Sanchez thought it a little odd that we should be driving a 5-ton truck. We agreed, but we explained that their own Mexican consulate in Los Angeles had advised on going as tourists. No avail. We must go back. After endless conferences in rapid Spanish, with Mr. Miller waving his hands in frustration at the perfidy of his own countrymen, we found that our permit stated that we were allowed to take in personnel and equipment, but that it was not possible to construe equipment as including a 5-ton truck, even if it was the only way we could ever hope to bring back live sawfish. The permit would have to be changed.

That evening I called the Mexican fish commission from our motel on the American side and requested an emergency change be made. Alas, it could only come from Mexico City, and this sometimes took weeks (which we very well knew from past experience). The man in San Pedro said he would try and mark it "urgente." So we relapsed in our rooms muttering and plotting new ways to stir up Mexican officialdom.

Our frustrations were just beginning, though we didn't know it.

February 26, 1960

Up this morning and right into a nice day's battle with regulation books. Mr. Miller escorted me to the Mexican consulate and the consul (a nice, wispy little woman) said she would be glad to issue me a commercial visa but that she saw no way else to go in if our permit was not changed. Hurray, I said, let's get a commercial visa. Aha, she said, where is your passport? None existed. I will get one, I said. Once again we thought we might be on our way until I found that this passport required a physical exam and took two weeks. The best thing they said was to fly to Los Angeles where I personally could hurry up recalcitrant officials. Off to the American consulate on the Mexican side. The

fine gentleman there told me that we were in a pickle. We agreed. He said he would call his embassy in Mexico City and attempt to have our fishing permit expedited or have the Mexican minister of transport give us a special permit for our truck. While he was stirring things the consul called Mr. Sanchez and badgered him a little, but the rule books held firm. He called the Mexican consul too and found that we might cross if one of us obtained "industrial clearance." "Let's get industrial clearance!" I shouted, clapping my care-worn hands. If you do it that way, he said, you might be through tomorrow morning." So, off I went to get industrial clearance, but this turned out to require a passport, too, so we were back in the soup again. If we only had one commercial visa all would have been well.

The real meat of our problem was that trucking in Mexico has been organized and no American drives a truck in Mexico for commercial purposes. Semis come up to the border and the American unhooks the trailer and a Mexican hooks on.

Well, maybe tomorrow our telegram would come.

February 27, 1960

It didn't. We called San Pedro and he hadn't heard either. He explained that telegrams sometimes took five days to get through official channels. Would he phone at our expense? He would, but how could we arrange the bookkeeping and all that? "Oh, good god man, forget the red tape and get us across the border!" No chance today because they only work half a day on Saturday and even under the best of circumstances inspection takes that long. Another poke at Sanchez and one at the American consul and our time was up. The latter gentleman was sure, however, that something would pop on Monday and maybe then we would get through on Tuesday.

With all the parlors closed where we might poke officials we relapsed and decided to take a drive into the surrounding country for the afternoon to ease our wounded souls a little. We piled in the pick-up and drove out west of Nogales to an old camp spot of mine in Alamo Canyon. This beautiful place was the site of an Apache massacre in Geronimo's time. The old adobe of a settler named Yak Bartless who was killed by these ferocious Indians stands there today in ruins.

We walked among them wondering what it must have been like during the time when it was in use, and what it must have been like to live in the midst of such savages as the Apaches. We hiked down the canyon under huge sycamores, alders, and willows, into the deep gorge of the main canyon. Great, precariously balanced spires of rock reach up from the canyon floor, some as high as 250 ft. Boots looked up at the wild scenery and opined, "If this whole thing was just under water it would be a damned fine octopus ground." It takes all kinds.

On our way back we stopped in at a place called "Pete Kitchen's Museum." It was run by a retired Army Colonel named Gill Proctor. The old adobe was the original farm house of Pete Kitchen and had seen the scars of Apache sieges for decades. It was full of a marvelous collection of Indian and early Spanish relics plus many things from the old west.

February 28, 1960

To keep from stewing over our troubles this Sunday, we decided on another ride. This time we headed east and drove to famous old Tombstone. It was a cold ride in the

back of the pick-up but interesting to see the tall, snow-capped mountains and the broad, grassy prairie between. Gradually the scenery changed to desert as we neared Tombstone. The town is a rather down-at-the-heels affair. We looked in at the OK Corral and decided they needed a little showmanship. First we decided, they should toss out all the old Model T Ford parts, spruce up the grounds a little, install a live horse or two, and stage the Earp-Clanton fight on the hour. Also, they needed Safady's touch in the gift shop. The Bird Cage Theatre was a little better but a few electrographed labels and a little classy announcing and gate keeping would have helped, not to mention some enlightened maintenance. As a final thought for pepping up the show at Tombstone we thought a snack bar would go over big, selling "Earp Burgers." Really, it was a shame to waste our talent.

February 29, 1960

After a call told us that our telegram hadn't arrived in Nogales, we called Bill Monahan and poured out the whole ghastly tale of woe. He went right to work on it by prodding numerous officials in Los Angeles and soon called back to say that the Mexican Fish Commission in San Pedro had received word of our permission. We learned however that telegrams sometimes take five times as long inside Mexico as outside and that there was no assurance that ours had gotten to Nogales. Phone calls were flying, including a long-distance one from Mexico City to Mr. Sanchez. We learned with great glee that it had been necessary to shut off all other phone service in Nogales when this call came in. The Monahan-poked Los Angeles Mexican Consul had also called, as had other people. Before the day was over Mr. Miller had occasion to call Sanchez and ask, "Do you remember Mr. Norris and his party who are trying to fish at San Blas?" Mr. Sanchez snorted: "Do I remember Mr. Norris? Ha! I not only remember Mr. Norris, I *dream* Mr. Norris." It looked like we were winning.

March 1, 1960

A call from Mr. Monahan at Marineland had informed us that our telegrams should be in the hands of the Mexican Fish Commission official in Nogales, a man we didn't know existed. Boots and I sought him out and found him up an unmarked flight of stairs in an unmarked office over a liquor store. Yes he had our telegram, in fact had had it late Saturday. Our impulse was not to leave him unmarked but we calmed ourselves and waited while he typed up a new permit and gave it to his secretary to type six more copies. Then we raced back to Mr. Miller and bonded our truck and gear. For all his work he charged us the princely sum of 8 dollars and would not take more. We were then inspected in several different planes and shooed across the border with moments to spare since the truck gate closes at 2 PM. We wound our way unbelievably through Nogales and out to the check station. We were so well known by this time and had so many official stamps and signatures that mordida was not even required. In minutes we roared out of the station and onto the open oad, unblocked by official Mexico. Diego Hoffa be damned!!

Several hours and a half dozen check stations later we reached the pretty town of Hermosillo, the capital of Sonora. There we holed up in a plush motel charging \$6 a night, complete with tile floors, floor show, and swimming pool.

March 2, 1960

We drove on toward Guaymas through a scrubby desert whose floor was carpeted with a veritable sea of orange mallow flowers. At Guaymas Frank and I inspected the harbor for the best spot to refresh our water supply on the way back. We found satisfactory water but it was so cold (66 degrees F.) that we doubted that we could hope to use very much for fear of killing our animals by temperature shock. On we went, passing through vast farms in the river deltas. Dams that have recently been constructed have converted thorn forest into wonderfully productive farms for grains, cotton, flax, vegetables, tobacco, and other crops.

We stopped for the night at a motel in the midst of the thorn forest just north of the Sinaloa border. The weather had begun to warm compared to the chill of Nogales. Boots and I took a little hike out into the thorn scrub, marveling at this spiny jungle which is so dense a man on horseback could not ride through it in many places. Some of the mesquites sport thorns more than two inches long and needle-sharp.

March 3, 1960

We pushed on over the reasonably good paved road toward Mazatlan. From time to time the road dipped into the foothills and we saw the thorn forest give way into the the short-tree forest composed of tangled vines and peculiar papery-barked trees, many covered with colorful flowers. By the time we had reached Culiacan we had begun to pass through groves of Sabal palms and the Mexican houses usually had thatched roofs very reminiscent of Africa. We saw our first parrots flying over in their peculiar direct flight, with wings beating rapidly in shallow strokes. After lunch at Culiacan, one of the oldest cities in North America, we climbed the mountains and rolled toward Mazatlan.

Our truck has three fuel tanks and one went dry on this grade so we switched over to a new one. Before long the truck began to sputter and lose power. However, once darkness fell it picked up and we cruised into Mazatlan and took a couple of rooms in a rather nice looking motel. A little ferret-faced, blue-eyed Mexican, who looked like he didn't like daylight, showed us to our rooms. We unloaded and went into town for dinner and a look around. Mazatlan is a picturesque place of narrow cobble streets, grated windows, doors ajar to reveal lush patios filled with palms and vines in sharp contrast to the dusty streets outside, Mexican rancheria music pouring from cantinas, idle men loitering under street lamps, plush tourist districts shunned by the working populace of the town, and a broad harbor filled with boats of all sorts.

Back at the motel Hackett and I went to sleep in spite of the mosquitos but Frank and Boots kept awake by the same beasts watched while the opposite bank of rooms from ours came to life about 11 PM with taxis shunting in and out and men and girls shuttling back and forth, laughing and drinking. Vice like poverty is accepted in this land as part of the scene.

March 4, 1960

Frank was up before dawn pacing around and waiting for one or two of us to stir so that he would have an excuse to rout out the rest of us. We were on the road early and plunged nearly at once into the foothills. The scenery became rapidly more tropical. Sixty-five miles south of Mazatlan we rumbled down the main street of a sleepy little sub-tropical town called Esquinapa. Palms were everywhere in evidence, and big, three-

foot iguanas became a common sight, crawling over the rocky walls lining fields. Many of the sabal palms were seen in the throttling grasp of vines that clung so tight that they dug into the palm trunk. Fig trees did the same and it was common to see the many-rooted trunks of figs with the crowns of all-but-hidden palms appearing among the fig leaves. The vulture population became at least equal to the human population. We noted three kinds—the common California vulture, Audubon's caracara, and the smaller black vulture. We suspected that these fleets of macabre birds made their livelihood from the dead livestock that dots the road edges. The stock runs free and is probably the biggest hazard to navigation that an American driver encounters. Donkeys, cattle, and horses all had fallen prey to cars and trucks, though the cows seemed the most vulnerable. The fleet-footed goats emerged with a record of 100% escape so far as we could tell from our sketchy roadside census. At any rate the carrion supply was in good shape and the vultures were all smiling as we passed.

The hills became more rugged as we reached a little hamlet called Rosario. This town boasted the ruins of a 300-year-old church standing on its hillside. Behind the town to the east we could see ridge after ridge of hills rising to the scarp of the Sierra Madre itself.

Not long after this the truck began to puff and wheeze again. We crept up grades in the lowest gears available with the engine popping and sputtering. Objecting all the way, it finally brought us to a turnoff which announced that San Blas was 26 miles off to the southwest. The road was paved and we weaved and wound our way down toward the coastal plain below. As the flats came nearer we dropped into a true jungle of tall, leafy trees, vines, and palms. Banana groves covered the hills in places, and were called "oro verde" by the Mexicans because of the value of the crop. Once we reached the plain we crossed a mangrove swamp and then a broad tidal inlet and entered San Blas. It is a true tropical town set in the midst of coconut palm groves, huge mango and papaya trees. The houses vary from calsomined adobes of every conceivable color to woven thatched houses to ancient adobe ruins from the days of San Blas's earlier glory as western North America's first seaport. We looked into one of these—the old customs house—its roof gone with figs growing and taking their very nourishment from the walls, ancient staircases circling upward to a floor that no longer existed, graceful arches and paved floors. Palms grew in the anteroom, and bougainvillea vines crawled across the second story porch.

We took rooms in a place called "Bungalows San Blas" for 20 pesos a day (\$1.70) and got our gear arranged. It was a nice two-story apartment with a central courtyard shaded by a 100-ft. mango tree. Our beds were a bit resistant and the shower fell directly onto the toilet but these were minor things, since we were in San Blas, our destination.

Then we scouted the beaches to find what we could about the sawfish situation. Our general plan in such ventures such as this is to ask innumerable questions and make no commitments for a day or so, meet what fishermen it seems wise to seek out, and generally learn the score. Then we make our decision and arrange for boats and so on. This avoids the sometimes fatal mistake of falling in with the wrong people at the outset and then having to leave them and cause bitterness. It isn't hard to find the best man for the job by this means as he will be recommended from various sources. The con artist will not. He will be recommended only by his cronies.

We learned that the sawfish were present and fished to some extent for livers and meat, the latter being esteemed in Mexico City and other inland towns. We learned that boats were few and mostly dugouts. Some of these were very large though, holding four or five tons loaded. Some were masterpieces of craftsmanship. To our delight, there was rather little surf to contend with, but a considerable shallow bar across the lagoon entrance.

Just before we left, the tiny gnats called "Cayenes" emerged and began to chew happily on the flavorful hides of newly imported touristas (us.) We decided we could stand their chewing if the bites didn't swell up later.

In the evening Hackett and I took a walk around town, listening to the juke boxes blaring rancheria music, chickens squawking, pigs squealing, dogs barking, and Mexican men whistling in the dark. Everywhere I have gone in Mexico this nighttime whistling is part of every village scene. Why, I don't know. Maybe they don't have enough money for a trumpet. Think what it would be like if they did.

We stopped in for a Corona (Mexican beer at its best) at what must rank as about the dirtiest bar I have ever entered. Then back to the rooms for the night. During the night, in spite of bug-bane which we applied liberally to our exposed but still delectable hides, hundreds of tiny soundless mosquitos came to feast upon the new turista harvest. They were so small that they passed readily through the screened windows. The Cayenes were no serious problem but these little monsters caused me to swell up in one continuous mass of bites on arms and legs. The others were not too affected but their time was to come later when the bugs found my scar tissue too tough to penetrate.

March 5, 1960

This day we made the rounds of the fish landings again and Frank and Boots (both getting pretty fluent with their Spanish) extracted much valuable information. I am a little more reticent and lack the backlog of Italian words to be thrown in in a pinch, but even my language is becoming pretty serviceable. Hackett was mum as he didn't want to act like a paunchy tourist in a loud shirt and dark glasses saying "Si, Si, Senor" in what he thought was Spanish.

Our path led to the Inspector de Pesca, one Senor Pepe Padilla. He spoke English well and directed us to one Luis Garcia Lopez. Mr. Garcia turned out to be our man, which was evident in a few minutes. He was the innovator in the port and had introduced nets for shark fishing and knew a great deal about sawfish, having a long, dotted series of scars across his chest and along one arm to prove it. His respect for the fish was great. He owned one of the best boats, a 18-20 ft. inboard with a small Gray gasoline engine. With little further ado we hired him along with a taciturn crew man named Caligsto Gamio-Chipe for about 15 dollars a day, including gas. We arranged to meet them at Matanchen, an open roadstead about two miles down the coast, where the sawfish were said to be common.

Having settled this we went back to our rooms and began to gather our gear. Frank and Boots and Don began assembling the big wire mesh vivederos, or live boxes, which we planned to use to hold the live sawfish.

We were fortunate in meeting two Americans at our bungalows who were most helpful. In fact these two men simply could not do enough for us. Both had given us the name of our Mexican fishermen and so had the Inspector de Pesca. One of the men, Paul

Brunell, promised to photograph our capture efforts and later send us a graphic record of the attempt. The other, Mr. I. W. Allen, helped with his fine cruiser which accompanied us and helped with some of the maneuvers. It is wonderful to meet such men in foreign lands if for no other reason than to know that they give Americans a good name in these countries.

With our pick-up loaded we relaxed and wandered down the cobble streets to a little restaurant called the Beachcomber. They offered filet mignon for 10 pesos, and a meal for four including beer all around and soup usually ran about 4-5 dollars. The filet was of variable quality and sometimes reflected the hard life of the cow that supplied it, but for the price the name alone was enough.

Frank stayed in the bungalow shooting the breeze with our American friends while Don and Boots and I went out on the town. We watched a fine baile, or dance, in the city square, where young girls danced shyly while their dueñas watched from the sidelines. An incredible orchestra sporting ancient valve trombones and tubas and maracas beat out the songs. The night was warm and we weren't sleepy so we dropped in at the pool hall for a couple of games. Boots allowed as how he didn't know the rules very well, but then proceeded to clean off the last ten balls without a miss. Four games cost 2 pesos, or 24 cents. Off to bed for tomorrow the sawfish collection was to begin.

March 6, 1960

We hustled ourselves out early and drove to Matanchen to meet Luis. It was an eerie, foggy morning. In the mist we watched two roseate spoonbills rise from the mangrove swamp and disappear—the first of this species I have ever seen. Before we reached the beach we drove through a dense mangrove forest with gloomy canals of drab green water flowing completely covered by the arcing limbs of mangroves. We could see snappers cruising along under the road bridge where it crossed these channels.

At the beach no Luis was in sight. While we waited we watched some skimmers feeding. These are big tern-like birds with large red bills. They were cruising along the water's edge within 20-30 yards of us. At the point where the water was swashing back and forth over the sand they would cruise in, lower their beaks until the tip was about a half inch below the surface, fly 30 or 40 yards in this position, and leave a perfect V-shaped wake. Their beaks were just slightly opened during this maneuver. They were attempting to catch some small killifish-like creatures that were schooling.

Finally, an hour overdue, Luis and his man appeared on the beach. They had mistaken our request and had waited for us at the bungalows. The delay was of no importance however, as it was too foggy to work since Luis could not see his landmarks. A cup of hot Mexican coffee and a little conversation and finally we jumped in the dugout canoa and paddled out to the little cruiser anchored offshore. Soon we were underway across the broad bight of Matanchen.

For five or six miles it is edged with a broad white-sand beach, finally ending on the south in a series of abrupt rocky cliffs. Offshore two or three miles is a shallow reef beyond which is the open clear sea. We heard reports of many fine reef fishes here. Such things as squirrel fish and Moorish idols were reportedly common. The bight itself has a muddy or sandy bottom and is very murky. It was a flat calm day with no indication of a swell. We saw many eagle rays flipping the tips of their wings above the surface, a few mobulas, or small mantas, and our American friends reported two 10-12-ft. whale sharks.

About two miles offshore we simply payed out the net and left it. Back at San Blas, Don and I left Frank and Boots and took a walk up to some ancient ruins that top a nearby volcanic bluff. The noontime heat was upon us, sapping much of our energy. We walked down the palm-bordered back streets of San Blas watching the iguanas slip off the rock walls as we passed. We then climbed up a dusty trail between shacks of saplings, into dense banana groves and finally out onto the bluff top. We were soon in the roofless ruins of an old fort. It was a massive structure and from its front parapet one commanded a view of the entire coastline. Old rusting cannons were still in place, pointing out over the coconut palms. We left the fort and wandered down a dirt road which shortly led us to the impressive ruin of an old church. Scattered on the grassy area in front of it were several old crypts, some half gone with age, and others intact. Inside the church we entered a massive room with a great vaulted ceiling whose roof was missing. The sunlight streaming in fell upon vines and palms growing near the place where the altar once stood. Two old beams still spanned the roof, though they were a lace-work of holes from boring insects. Outside, some of the outbuildings could still be seen though they were locked in the grasp of hundreds of roots from giant fig trees that grew over them. The roots were literally tearing the ruin to pieces.

San Blas is the oldest port of the west coast of North America, having been established in Cortez's time, about 1535. It was the major stopping place for the Manilla galleons, upon their return across the Pacific. Here crews stopped for water and fresh fruit to cure the ever-present scurvy. I doubt that these ruins date nearly this far back but they were doubtless quite old.

We returned to Matanchen at 5 PM, boarded the boat and made for the net. After a minor bit of engine trouble we reached it and found the corks down in a couple of places. The first thing we pulled up was a drowned green turtle, then a live one, and then up out of the murk Frank and Boots pulled a great thrashing sawfish. Luis cautioned us to stand back. He stripped to his shorts and leaped into the ocean with a piece of rope in hand. Gingerly he slipped a noose around the bill of the fish, being very careful to stay well out of reach of the blade. The saw of these fishes is edged with equal rows of triangular blades more than an inch in length. One swipe would sink them to the hilt in an unwary person.

Then Luis climbed on board and while still dripping water he and Frank and Boots secured the tail of the big fish. It was then cut free by the flying knives of our collectors and left astern on the tether. Don tended the ropes attached to it while the boys went on down the net so see what else was in store. We found two more big sawfish—one about 15 ft. long, or three ft. longer than the tank. We towed them all in very slowly and anchored them out in the bay with buoys and head and tail ropes secured to anchors.

It was something of a puzzle how we were to handle these extremely dangerous and powerful animals. We left this for discussions over dinner to solve and made our way ashore, elated at the easy success in capturing our quarry. Such luck as this very seldom occurs in fish collecting. Usually there is much learning to be done before capture is successful. Don and I figured it was because Dr. VanDenburgh had been taking good care of us. We had seen him in Los Angeles when we were getting visas and once again in Mazatlan. This latter encounter was second to none in my memory. He was old and wrinkled as he should be, with a cane, a long white beard, trifocals, a stalkers cap, and leather and canvas jodhpurs. We watched him for a block as he pottered along, spreading

benevolence on all collectors. How Frank and Boots explain it, I don't know. I rather think they don't take too much stock in Dr. VanDenburgh.

March 7, 1960

Frank and Boots planned to set the net again today while Don and I went into Tepic to obtain a few small items plus a permit for the big truck to pass on the roads. In the course of our trip down we had learned that it is fine to operate a truck in town with an ordinary license but on the open road one is required to have a thing called "permiso carretera."

So off we went up the long road to the junction with the main highway and then up farther and farther from sea. We passed through a forest of leafless trees with big yellow blossoms. From a distance they looked like hundreds of lighted candles amid the foliage. Before Tepic is reached the road leads up into the oak belt. Most people don't suspect that Mexico is the motherland of the oaks of the world since there are scores of species living on the flanks of the Sierra Madres. Tepic itself is a hot, dusty town with rutted, rocky streets teeming with cars, carts, horses, people on foot and assorted animals. Aside from being on the main road it has little contact with the tourist flow in Mexico, since it has little to offer them.

We obtained our permit with ease, and what's more, no cost, at the Ministerio de Transportes office, and returned to San Blas. The net was in the water when we arrived and so we began packing gear and rearranging for the long trip home in the event that we should be lucky enough to catch some new fish. Our plan was to use the freshest fish we could catch for the trip home and to use those on the tether only if necessary.

Boots gave us another pool lesson and we went to bed.

March 8, 1960

Frank and Boots were up early and off with Luis while Don and I gassed the big truck and took her down to the Matanchen Beach and began loading water. Don stood out in the water and held the inlet hose while I rigged the pump ashore and started it up. At best this bay water is murky, but it is good fresh sea water even so, and a little filtration should bring it around.

The collecting crew appeared with another sawfish, and bless them, a nice 6- or 7-ft. nurses shark in tow. The sawfish had been taken from the very end of the net, after hope of success had all but been given up. They had also taken one huge old bruiser of a sawfish that could never be transported because of his size. I had calculated weights and in terms of our water volume about the best we could hope to haul would be a thousand pounds of fish (the equivalent of a heavy bait tank load with constant fresh seawater) and even this was putting a lot of faith in the efficiency of our gear. We would have to do better than anyone had ever done to haul this weight successfully for nearly 1,700 miles over the uncertain roads of Mexico. This meant that our load would be limited to two 12-ft. sawfish and the nurse shark, and even this would probably slightly exceed 1,000 lbs. of fish.

We began loading shortly. Luis and Caligsto cut saplings and wiggled them into the sand just outside the surf. One pair of poles was placed 8 in. apart and the other about 15 ft. back. The fish was then maneuvered until his saw protruded between the poles in front and his tail was tied to the rear pole. Then we slipped the rubber innertubes over his

saw and secured them lightly in place. Then a pole was tied lengthwise on his huge body, fore and aft. With this we lifted the animal onto the canvas stretcher. The pole was then released and we walked the beast up the beach. After a difficult struggle we hauled and lifted the beast onto the tank (I fell in) and slid him into the murky interior. This was repeated with the other two animals and the diesel generator started, circulation pumps turned on and filters started.

Then we left the rig standing alongside the dirt road while the fish calmed a bit. After two hours Boots and I discharged about 2/3 of the water while Frank and Don loaded up back at San Blas. We then refilled the tank with new water. This was done to eliminate early waste products from the fish that might have been given off in their early thrashings and excitement. Then, we said our goodbyes, over a couple of Coronas and left our friends. The truck drove better than we had hoped under full load. In fact there was rather little difference between it fully loaded and just carrying the tank unit empty.

We were soon on the road and winding our way up toward the main highway. It was frightening to say the least, going around banked turns with this load of water as the truck leaned ominously on each one. After about 15 miles our old sputtering trouble returned again, much to our horror. We thought we had solved it but we hadn't. Finally Frank sat on the running board and adjusted the carburetor while I drove. The truck picked up at once and began running pretty well again with a richer mixture. We were just sitting back congratulating ourselves when a loud bang startled us both. Frank said, "Blowout," and sure enough he was right—only there were two instead of just one. Both tires on one side of the floating rear axle had gone. We stopped in dismay thinking that this might scotch any chance we had of getting our charges home alive. After a brief conference we decided to leave Boots and Don at the truck to put on the spare while Frank and I drove to Tepic with the two bad tires. After a little searching in Tepic we found the main Goodyear dealer and asked about tires. We soon learned that Tepic had no such tires and that our only chance was Guadalajara. More conferences. Finally we placed a rush order for two tires of our size at a cost of nearly 400 American dollars. They would be delivered by 1 PM the next day, we were told. So, we ruefully left, bought some food for dinner, and drove back to our truck. There the boys had finally gotten the tire on after a terrible struggle. I was a distinct candidate for execution when I told them it would have to come off again as we couldn't put a new tire with an old one.

We munched our dinner, drank our coffee, and set up cots alongside the road and were soon asleep in spite of the passage of trucks and cars a few feet from our ears. Thank goodness we were off the main road or it really would have been bad. The mosquitos came, but this time they ignored me and all but swallowed Boots in one gulp.

March 9, 1960

About 9:00 AM, Frank and Don and I left for Tepic to pick up our tires. Boots stayed with the truck, with the diesel faithfully banging away in his ear. In town we fidgeted and squirmed and walked the town waiting for the tires. Finally about 2:30 they came, and tragedy—they were the wrong size. I sank into despair but Frank soon saw that the size was only very slightly larger and that we would be able to use them. So we hoisted them into the pick-up and left for the big rig.

With the size so close to the other tires we simply put a new one alongside the spare, which was a new retread, battened everything down, and broke camp about 5 PM.

The fish were still doing well and our filter was able to keep the debris down in the water to a satisfactory level.

Off we went, but our travail was not over by a long way. The engine of the big rig was only lulling us a little by running on the richer mixture and soon began to sputter and pop. All night long we drove it and it got worse and worse. Eventually it became so bad that if one shifted slightly in the seat while driving, the slight movement of the foot on the accelerator would cause it to cut out and die. We tried a dozen theories and nothing worked.

Finally, 12 hours later and 150 miles up the road, I pulled over onto the side of the road and said, "No more—we'll take the coil off and drive to Mazatlan in the pick-up for a spare." The coil was the reigning theory of the moment, since a mechanic we had roused in the middle of the night in a place called Acaponeta, said it wasn't working right.

March 10, 1960

So, Frank and I drove off again, coil in hand. Mazatlan was about 30 miles down the road. Nowhere in all Mazatlan had they seen a coil like ours. We found one that looked just like it but it was 6 volts and not 12. Finally we bought a light duty 12-volt coil and returned. It was installed, the rig started, and it sputtered inside of 200 yards. Despair settling once again. How long the sawfish could take it we didn't know, but they had better be plenty tough. Frank and I sat on the fender and I said, "Once more, let's just take off the sight glass and see if it's dirty." We did this and I blew a lot of rust out of the filter, getting a nice mouthful of Mexican low octane for my pains. Boots and Frank then said, "Let's open the screen port on the carburetor, too." Frank did this and a ghastly mixture of rust and gas poured out over the engine. With these things in place the truck bounded away, carrying its 45,000 lbs. in wonderful style. WHAT a relief!!! We picked up about four hours sleep at Mazatlan and a little breakfast and drove on. We drove and drove, happily now that we had a chance for success. At Guaymas we called another halt and parked the rig in a big lot next to the gas station. Out came the cots again and four hours more sleep put us in good shape.

March 11, 1960

Back in the rigs again and up the road. Don and I took turns curling up in the cab while the other drove. I found by taking my shoes off that I could coil up, cocoon-style, against the door, with my feet locked in the windwing and my head on the Spanish dictionary, more or less upside-down, and get a few minutes precious sleep. When one is as tired as we were, it doesn't make much difference what position you are in.

Somewhere along the road we stopped at one of our numerous truck stops to show our papers. I summoned up my finest colloquial Spanish and announced to the guard (as we later translated it), "I came a sawfish." He twitched his hairline mustache slightly. I quickly followed with, "You are alive." He rolled his eyes and fingered his .45, jerked his thumb down the road, and walked back into his guard shack. We left.

On through Hermosillo, and over dozens of torn-up strips of road, dozens of filter changes, occasional bits of food here and there, to Santa Ana. Here we planned to take a new road to the west that would take us over the flat desert and cut our journey by nearly a hundred miles. The road began as a long detour and with no end in sight we turned back

and onto the Nogales road. We arrived there in the afternoon to find the red tape waiting. We also found Mr. Miller, bless him, waiting. It was a weekend and we could not get the bonding officer down unless we paid him and three other men time and a half. One of the men to be paid was our old friend Sanchez. I met Miller and he drove me to Sanchez's house. He literally tore said Sanchez apart for this perfidy and finally Sanchez called the border guards. By the time we returned the inspection was over and we had five minutes to get through the truck gate before it closed (2 PM). I leaped into the rig and roared through the gate onto blessed American soil, free from the clawing fingers of Mexican officialdom. We were soon on the road again, having cleared American customs in a few minutes. On we drove, checking from time to time to inspect the animals and the filter and the other gear. A crack had developed in a pipe above the main pump, but it looked like it might hold till we got home.

At Sentinel, Arizona, I called a halt again and we got another four hours by our noisy diesel generator, which bothered us not at all.

March 12, 1960

Up at dawn and onto the road. I called in at Yuma, miscalculating our distance from home by 100 miles, so he had to call in again at Indio for a reappraisal. Then, in the San Gorgonio Pass we ran head on into a head-to-tail traffic jam that extended more or less solidly clear to Corona. We didn't want to stop to call again, and were sorry to find on arrival that our lateness had caused much concern. We finally saw the lights of Marineland and drove in about 8 PM, with fish and personnel intact and the unit banging away. An auxiliary line was rigged and the diesel shut off for the first time since San Blas. The silence that ensued was almost a shock to us after having lived in a din of truck and generator motors for 1,700 miles. Mr. Harris and Mr. Monahan and all the rest of the Marineland crew welcomed us in. We were motley and dirty and tired but the fish were alive and seemed in good condition, and that is just about all that counted.

March 24, 1961

Papago Tanks, Sonora, Mexico

Mark Buchanan, Jim and Maxine Heath, and I left about noon from UCLA, drove down the coast under cloudy cold skies to Hwy 80 and across the crest of the ridge. Long after dark we made the crossing at Mexicali and drove on across the river. All the regulations had changed as usual but we were freed after a few words.

Camp was made on the desert about 10 miles east of San Luis.

March 25, 1961

Papago Tanks, Sonora, Mexico

Up at 8:30 or so to a breezy, cloudy day. Mark got his VW stuck in the sand but we were soon out and off.

No animals except adult *Citeller tereticaudus* [?]. We drove past the cut-off road to Papago Tanks and had breakfast at Los Vidrios six miles beyond. There we met Julian Hayden an amateur archaeologist, and an old Mexican who had been Lumholtz's guide when he visited the Sierra Priate near the turn of the century. We backtracked and turned off on a fair dirt road to the south of a conspicuous granite peak capped with lava. Some eight to ten miles south we stopped at a lava rise to the right of the road and walked up to look into MacDougall Crater—it is between 250-300 yards across with raised edges all around and with no obvious flows resulting from it. It looks more like a meteor crater than a lava crater. The bottom is sand filled and about 100-120 ft. below level of surrounding desert. We saw three other craters that similarly had no obvious flows.

We drove through scattered lava flows and washes to Papago Tanks. It is set in a low broken lava flow and consists of a series of pools set in water-worn lava. To the west is a wash choked with palo verdes, ironwoods, and other shrubs.

Many birds were seen. Ravens had set up stations along the banks of the creek and had spattered the rocks with white. Gambel's sparrows, swallows, broad-tail hummers, and doves were seen.

The only lizard seen was *Uta stansburiana*. It was seen only in sandy areas or at the edge of lava flows. None were conspicuously dark though reddish buff is a predominant dorso-lateral color. Much of the lava hereabouts is red. I think we are seeing intergrades.

March 26, 1961,

Papago Tanks, Sonora, Mexico

Last night was cold, not too far above freezing, but the day dawned clear and calm. Bill Woodin, Joseph Krutsch, Mero Larso and wives and kids left for home before noon, leaving us with Julian Hayden the archaeologist and the old fellow who had guided Carl Lumholtz back about 1910, Don Alberto Celaya.

I started off about noon, hiking northeast toward Sykes Crater. The Papago tanks are set in a lava ravine and consist, at this time, of only two pools 15-20 ft. long and 2-4 ft. deep. The water is green and scummy and buzzing with bees and covered with water striders. The rocks in the canyon bottom are iron gray in color and marked with water lines several feet up their walls. These rocks are mostly smoothed and sculptured by water erosion. Plants in the arroyo are *Hyptis*, mesquites, *Olneya*, *Baccharis*, bunchgrass, *Cercidium floridianum*, and many annuals including *Sphaeralcea*.

I cut off from the tanks and up on top a lava bench covered mostly with small lava chunks. Utas were fairly common on the lava, particularly where the rocks were several ft. high. The animals were quite dark and matched well to the rocks. Both have a rusty red cast. The breeding male utas are beautiful animals covered with bright bluish punctuations (of one or two scales) on the rufous background turning bright red on the lateral abdomen.

I scared a male *Uta* into the territory of a smaller snake who had been hiding under a flake of lava. The small snake rushed out at the intruder and assumed a rather grotesque posture with body curved and laterally flattened. The little lizard sidled toward the larger male in this posture and the large animal avoided him. There was no contact. The posture of the small animal had the effect of showing its axillary side blotch to the large male. [Drawing]

I walked on up on a broad lava flat following a trail that leads from the tanques toward Syke's Crater. Here I scared up *Callisaurus* whose back was a dark chocolate brown, matching the surface perfectly. I shot the animal and continued on toward the crater which loomed up ahead like a broad 300-400 ft. sloping earth-filled dam. I cut down a broad wash at the base of the crater and toward camp. Soon I found my first whiptail lizard of the season and a umber of utas, plus the still-smoking campfire of some Mexican woodcutters who had come into camp last night, and turned around and left.

On the way back I picked up a small horned lizard whose head is as black as coal and whose body is blotched with black.

The palo verdes are in bloom and the hummingbirds are migrating through. Mark took three species (rufous, broadtail, and Costa's). Their bills are yellow with pollen when taken. Outside now I can hear the poorwills calling and can see Julian's campfire blazing under a huge old palo verde so I think I will go talk to him and the old man for a while.

March 27 1961

Papago Tanks, Sonora, Mexico

Up about 8:00 A.M. Maxine cooked up a fine breakfast of bacon, eggs, and orange juice while we talked to Julian about early Arizona culture. Soon Julian and the old man picked up their gear and left for Sonoita. We packed a little lunch in the jeep and set off for Indian Camp. This is a locality 16 miles south on Papago Tanks.

The road leads along the west slopes of the Sierra Pinacate. About three miles S. of camp we passed a rugged new lava flow and continued along its west side down the lava slope. Off to the west we could see the great expanse of the Gran Desierto, which is covered with sand hills.

The Hormiday Range could be seen out amongst the mass of dunes as a saw-toothed granite ridge half buried in sand.

The road led us into deep sand in a little flat area covered with lush creosote and palo verde thickets and thence up onto a lava bench. The rough, jouncy road then took us down off the bench to a gently sloping valley directly behind the dunes and near a pair of cinder cones. We stopped under a palo verde and hiked out onto the dunes where we caught a few beautiful, buff-colored umas on the dunes and some *Callisaurus*. On the hike back we shot a rufous crowned warbler (*Vermivora ruficapilla*) and wandered among the bushes looking for bush utas.

It had warmed to about 90 degrees F. and we were glad to rest for lunch in the shade of our palo verde.

Later we drove to Indian Camp proper, about ½ a mile back up the road away from the dunes. We found a large broken olla and hiked around over the valley floor.

On the drive back we came upon a huge covey of desert quail of which Mark obtained a few for his collection.

The sun dropped low over the Gran Desierto to the west and the shadows made the sea of dunes stand out in relief like a billowing [?]. Far beyond we could see the crest of La Providencia on the mainland of Baja California. In the dune mass flat-topped lava buttes rose up, black against the white sand.

Back at camp we cooked dinner, set a mist net over the waterhole and talked, mostly about Mark's experiences with various naturalists.

So off to the sack.

August 3, 1961

Bahia Los Angeles, Baja California del Norte

After spending the night at George Lindsay's house, Tom Poulson and I were chauffeured by John Sloan to the airport where we picked up Bill Dawson and headed for Tijuana and the airport. There we found Sr. Munoz, the pilot, waiting for us. We loaded our plunder into the Beechcraft (or I should say, it was loaded for us) and took off for Los Angeles Bay.

The flight took us diagonally south over the backbone of the peninsula toward our bay. I was interested to look at the gently rising west slope of the Sierra Juarez and to see the criss-crossing of fault lines over its face. Many streams have followed these lines and deeply dissected the terrain. A number of streams appeared to follow courses not related either to formations or faulting.

As we neared the crest the canyons became deeper and pines appeared below us.

Before long we cruised over La Encantada (I believe), the highest of the upland meadows of the San Pedro Martir. In the center of the meadow were two small shining ponds, which I am told, harbor the endemic *Salmo gairdneri nelsoni* of these mountains. We passed over a number of other clearings and meadows among the pines as we flew along. Sr. Munoz called me to the pilot's cabin and pointed out La Providencia, the highest peak in Baja, which rises about 10,000 ft. It is a rugged pyramid of exfoliating granite boulders slightly separated from the main spine of the mountains toward the desert to the east.

As we passed over the crest of the Martir we could look down the long north-south trending alluvial valley east of the scarp. It is desolate desert. I saw water in a large streambed passing around the south end of the Martir and a dirt road hugging the base of the scarp. The valley looks easily navigable with four-wheel drive.

Farther SE we cut over desolate lava flow desert cut by meandering washes and occasionally lined with double rows of *Washingtonia* palms, one row per bank. We began to see the black spikes of cardon cactus, which became abundant by the time we reached the bay. Before long we reached the gulf coast and began to follow it southward. The Ancantadas Islands hove into view—Muerto, Coloradito, San Luis, etc. I could see the landlocked lagoon at the north end of San Luis. Angel de la Guarda too came into

view as we flew over the Punta Final area and finally we swooped down onto Los Angeles Bay, crossed the field, banked out over the Bay and directly in toward the enormous rugged mountain, finally banking around and down onto the bumpy field by the beach.

The village of probably two dozen adobes and wood and stone houses is scattered haphazardly against the base of the mountain around a spring which supplies the village's water. We checked in at Casa Diaz, the town's central theme and *raison d'être*. It is a store, pleasant restaurant, patio with *Jatropha* and *Bougainvillea* trained on trellises and houses sprawled about. Cerveza and cold pop is to be had and cottages can be rented. We will eat our meals there.

Then we ran down to the station and began to get ourselves organized. The station is huge old gold mine headquarters just off the end of the airstrip. It faces right out on the bay. There is a fine big cement verandah, showers, john (which flushes), power plant, fireplace (which we scarcely need in August), work tables, beds and cots, kitchen, and much other gear.

Water is good, coming from the spring on the hill. We unloaded and went for a hike north along the beach. Low hummock dunes line the shore, most topped by *Allenrolfia* bushes. *Callisaurus d. carminensis* was very common and we sometimes had five in flight at once. The sand-flat tidal area widened as we walked, finally spreading into an extensive flat traversed by meandering channels, perhaps 400 yards wide.

The flat was honeycombed with Sally lightfoot crab (*Uca* sp.) burrows. Each burrow was surrounded by a bare circle of sand and then a circle of cast sand pellets thrown up from the central burrow. The crabs stood near their burrows with large claw raised and waving up and down at a regular period. The effect of 10,000 such crabs waving white claws clear across the flat was unique. Each gave a dull flash of white as it moved.

Farther out on the flat we came upon ucas with red claws and finally field upon field of lavender-rose colored ucas of an entirely different species. They may not have been ucas for all we know.

We saw many birds—ospreys, blue-footed boobied circling high in the air, yellow-footed Western gulls, reddish egrets, Belding's plover?, brown pelicans in great v-shaped echelons very high in the sky, and we even saw what I take to be finback whales far out in the channel. Their tall spouts were visible for several miles. John Sloan met us in the station carry all and gave us a welcome ride back.

We dropped in for dinner and a beer at Diaz and were served California lobster (caught locally), great big platter-sized tortillas and beans and a great meal.

We took a walk up to the spring and found a croaking chorus of *Hyla arenicolor* at work. Date and *Washingtonia* palms are scattered near the water, which is divided into two pools, one for animals which runs sluggishly out of a cut in the hill and the other which is in a [?] cut but damned off by a cement wall to prevent entry by the animals.

The place is calm and peaceful. Everybody is in bed by 9:00 P.M. and I'd better stop now and do the same.

I should mention that we have come up with two thermographs (one hygro) and no ink to run the miserable critters. I spent hours cussing my research assistant who promised to take care of the ink, and tryig to devise a substitute. No luck thus far though. Curses!!

It started raining in the afternoon up the broad alluvial valley to the south of us. Huge thunderheads gathered there obscuring the mountain-tops; and also over the crest of Angel de la Guarda.

After we went to bed the first rain in three years began to fall and continued for several hours during the night.

August 4, 1961

Los Angeles Bay, Mexico

Up this morning about 8:00 A.M. and up to a breakfast at Diaz's. Bacon, eggs, and coffee and then off to visit Smith Island. Our boatman, Felix, led us down to the station boat which we hauled down to the water's edge and loaded. Soon we were cruising out past the sand spit and I among the complex of barren islands just beyond. Finback whales were everywhere in evidence, usually in pairs, spouting their tall plumes of vapor and rolling slowly up as they slid through the water. Many of the sightings were of a pair or larger group, though we did see some singles. In one case I saw what appeared to be a mother and a half-grown. Sometimes we saw the animals within 100-200 yards off island shores.

Before long we headed into a deep calm cove near the north end of Ventana Island where we beached the skiff and jumped ashore. It was about 9:30 A.M. or so and we walked up the steep canyons before the day's heat had closed in.

Bill and Tom and I went up one steep branch canyon. The rocks were gneiss and did not provide really adequate shelter for chuckwallas. We shot several utas and I collected a peculiar velvety red spider under a rock.

Tom collected a baby chuckwalla and before long we started back, since so little was in evidence and our subject the chuckwalla, was very little in evidence. I stopped at an osprey nest and found it to be peppered with shells—murex, turbans, etc. Whether they represent food or ornamentation, I cannot say. Most of the rest was of ocotillo poles, some 1-1½ in. through and 5½ to 6 ft. long, and algae. There were no scats or animal bones.

Back at the boat we shoved off for Smith Island again, crossing a channel which had already grow choppy. More whales and many birds (boobies, terns, gulls, herons) later and we came upon the entrance to Smith (Schmidt?) Lagoon on Smith Island. We wound through a channel 50 yards wide with a rocky bluff on one side—a *Allenrolfia*-covered barrier bar on the other and into a beautiful landlocked lagoon surrounded on two sides by steep, rocky, very barren hills. We beached the boat on the far bar and hopped out. I climbed up a rocky draw, seeing no animals but a few utas. But over the crest I could see down into a starkly barren valley in one end of which the tide entered over a shallow flat. All around the water were mangroves dipping their feet in the water. I hiked down and watched schools of tiny fish pouring in and out of the lagoon mouth, hiked back up and over the ridge and back to the boat.

There we had lunch, a dip in the lagoon, and had just about readied ourselves to go when Tom and Bill spied a peculiar bird in the *Allenrolfia* thicket. It proved to be a black-headed grosbeak female (*Pheucticus melanocephalus*), which is far out of normal habitat which is transition-upper Sonoran.

No chuckwalla so off we went down the coast looking for granite outcrops. Finally we found one area where a band of granite 400-500 yards wide made up the

island from sea level to the crest of the island 1500 ft. above. There were many exfoliating boulders and steep canyons choked with boulders. It had grown very hot and the sun beat down on us unmercifully as we trudged upward boxed in the stifling still air of the cayon. Bill spotted a chuck on the skyline so we scrambled wearily up after it but even though we got a good view—could not find it when we arrived at the site.

Down far below us rocks from our efforts tumbled into the perfectly clear still greenish water, startling a flock of blue-footed boobies from their perches.

I went on up and finally could look down at the base of a huge cinder cone that forms the north end of the island. A most unique lagoonlet has been found there almost exactly in the shape of a circle cut off from the sea by a narrow bar of stones [drawing]. I can't imagine how it was formed. I clambered over granite rocks and down another steep ridge on my way back. About halfway down I saw a huge old chuck on a great granite boulder oriented so as to present its back 90 degrees to the sun. His body was notably inflated and fat. I watched the animal for a time and then attempted to get a temperature record but could not pry it out of its crevice. There were no sticks or poles around.

Half an hour later I reached the beach, hot and pooped. We climbed aboard, drank ½ gallon of water and started for home. The clouds shrouded the valley south of L.A. Bay again and the veils of rain were falling by the time the boat was beached and gear stored.

A turtle dinner later, notes and off to bed in 90% humidity.

August 5, 1961

Los Angeles Bay, Baja California del Norte, Mexico

Up this morning early (John spent much time raving about the red sunrise which the others of us missed). Our plan was to run over to Mission San Borjas some 36 miles into the back country. We loaded the International[?] 4X carryall, picked up John's wife's uncle, a fellow named Jarvis Waldo Dennison (everyone calls him "Denny"). He is a recently retired Airforce Colonel and ex adventurer-in-the-tropics. Interesting fellow.

We drove south along the airport and shortly cut back into a prominent canyon, where walls are made largely of a deep reddish rock. Cardons, elephant trees, limber bush, *Asclepias*, and what we took to be a peculiar euphorb were common. Creosote bush is also common though seldom lush. Shortly the road took us up out of the canyon and onto some broad mesa land. I began looking for *Dipsosaurus* whereupon Bill Dawson announced that they wouldn't be out for an hour. No sooner had he finished this pronouncement than I saw one and whooped for us to stop. It was apparently the central Baja form, just seven miles from L.A. Bay.

I was about to shoot it [?] when it ran under an ocotillo bush. I began to dig out its burrow and unwisely did not use a stick. I hadn't gone more than a few inches when I felt something move under my fingers. Fortunately I didn't grab but recoiled since it proved to be a Baja California rattlesnake as about 6 in. of its body poked out of the sand. Apparently I had prodded it near its head!! A lesson learned, I hope. We handed it out with a snake stick and it was about two ft. long, and quite fat. We didn't retrieve the lizard after this but drove on. Much too close for comfort.

Before long (14 miles from L.A. Bay) we came to the cut-off to San Borjas and turned SW on it. It lead through a broad sandy valley containing one of the finest stands of cirios I have ever seen. Most were in bloom with their tiny ridiculous tuft of waxy

white flowers spraying from atop the stack of the plant. The road eventually turned south onto rugged volcanic country clothed by a dense forest of cardons, cirios, agaves, and smaller brush. The carry-all gave us a terrible jouncing although John is one of the more skillfull desert drivers I have met.

Finally long after noon we pounded our way around the apron of a huge lava mesa and could see San Borjas below. It sits like a [?] of bright green against the drab dun and olive of the desert vegetation and the brick red of the hills.

Soon we entered the village of half a dozen huts, which surround but are dominated by the sturdy old mission. The mission itself is L-shaped with the main chapel along the front and other rooms on the other wing—probably priests' quarters etc. Behind the L are numerous weathering adobes that once formed the tanneries, storage rooms, Indian quarters, bakeries, and the like. The mission itself is made of a very soft whitish conglomerate which I think was quarried from the hill north of town where we could see a prominent scar.

The Mission has two old bronze bells whose inscriptions I could not read. They hang from a bell tower on the east face of the church. In the church itself a statue of the Virgin Mary stood at the end of the empty church with small red candles burning beneath it. Overhead the arched roof of the church stood intact, made of ingeniously morticed pieces of stone. Outside we could see that fieldstone had been piled over the top of the roof and this had been plastered with adobe or lime.

The belfry is reached by a tight steep spiral staircase, each riser made of a single cut stone shaped like the outline sketched here [drawing]. From the belfry one can look out over the peaceful green of palms, figs, sapotes, dates, and adobes, or one can look into the cavernous stillness of the church.

We picked up our lunch and cameras and trudged up toward the springs of the valley. They are noted as having the best water in Baja and I believe it. It is sparkling and sweet as it bubbles from the base of a lava mesa onto the broad sandy arroyo of San Borgas Valley. To this day, however, it is still one of the most remote corners of Christendom, as it was at its founding.

We plunked down next to a big cement water tank under a huge old sapote tree, whose shade was complete. A few filched grapes from some vines nearby, cool water, crackers, cheese, salami, and a prone position on a bed of dried sapote leaves made for a complete peaceful lunch. Purple martins and violet green swallows swooping over the tank contributed to the scene.

We bestirred ourselves, trudged back to the car, filled our canteens, and rolled off down the dusty road, leaving this peaceful spot behind regretfully.

The long bumpy road back was uneventful. We all beame drowsy with the jouncy ride and poor John drove on in silence for many a mile. We arrived hot, dusty, and thirsty, at Los Angeles Bay. Beer and dinner rounded out the day—tomorrow we are off for Angel de la Guarda. We packed our gear and moved our cots out onto the front veranda. It was still and hot and almost saturated with humidity (90-95%). Dennie came over and told us of his experiences barnstorming in South America with Johny Angel and after he left we went to sleep.

August 6, 1961
Puerto Refugio, Angel de la Guarda Island

Up at 4:30 A.M. as Bill woke and routed us out. We quickly dressed and put our gear in the trunk and drove down to the beach. In a few minutes a skiff from the 80 ft. sutchaser[?] *St. Augustine I* came ashore and picked us up. Before 6:00 we were steaming out of the bay and threading our way among the islands at the entrance. Finback whales were once again everywhere. I counted five spouts in the air at once. The animals impress me as small (40-50 ft.).

We grew drowsy after our short night's sleep and flaked out on the deck.

After five hours cruising we reached the north end of the island and entered Puerto Refugio. There are several islands, one of which blocks off a perfect harbor, safe from about every conceivable storm wind. The mountains are rugged, sculptured and fluted by erosion and of reds, whites, and buffs. The water is crystal clear and emerald, and still as a mill pond.

Both islands and the mainland mass are dotted with big cardon cactus. The effect is of great beauty, arid and austere but with a beautiful beckoning sea.

After anchoring we jumped in the skiff and landed on the main west island. We readied ourselves for collecting and hiked up the boulder-strewn wash at 11:00 A.M. It was already very hot and we considered ourselves lucky to find chuckwallas still active. Two great burly fellows were found on rocks, facing into the sun. They retreated to absurdly inadequate crevices and we hauled them out easily.

About noon we found another pair in the shade. The day had grown torrid and near saturation with humidity so we called it quits and walked back to the beach, where we all stripped off our salty steaming clothes and waded into the warm, clear water. It was delicious!! We paddled around for a while and soon the boat came to pick us up for lunch. As we dressed, clouds of mosquitoes descended on us from the shaded crevices, and we were glad to dress and leave.

After lunch on board we sat out the heat of the afternoon under the afterdeck tarp. About 5:00 we went back ashore to look for afternoon emergence in the chuckwallas. We landed in a fog of mosquitoes and swatted our way up the still-baking alluvial fan. Not a chuckwalla in sight. Apparently they had stayed in. We hiked up a steep knife-edge ridge of granite boulders and cardon cactus. About 500 ft. up Bill shouted that he saw a peculiar lizard with a collar of black around its neck. I clambered over and it proved to be a little known rock uta, *Streptosaurus repens*. Before long I had a nice series of these big rock-dwellers. All were clinging to rocks in the shade. Their agility at running over rock surfaces is amazing since they can actually run hanging upside-down on overhangs.

The view from the ridge was a striking one, reminding me of what I conceive the Galapagos to look like—emerald inlets, clear, still water, varicolored barren islands and white beaches, cactus, and other sparse, low vegetation.

Back on board the heat closed around us like a sweaty cloak and it stayed that way all night, except when the breeze came blissfully upon us. As the wind [?], the mosquitoes closed in and tormented us unmercifully. It was too hot to cover up or to go below and too hot to dress so we relied on bug bane and the breeze—neither did a great deal of good and we all spent a fitful night punctuated by low curses and slapping noises.

August 7, 1961
Los Angeles Bay

Up at dawn and up anchor for Isla Granito on the east limb of Puerto Refugio. The skiff boy took us ashore at a granite sand beach in the middle of the island. Steep granite boulder slopes rose on either side of us, dotted with cardons. Blissfully not a mosquito showed its miserable buzzing head. Soon we spotted chuckwallas emerging from their rock crevices in the shade. Their saurian heads poked out here and there far up the slope. With them were many downy gray young pelicans, just about ready to fly. Bill and I hiked to the top of the island up over loose boulders and sliding gravel and obtained several lizards.

Far below us on the granite cobble beach were dozens of gulf sea lions and other little babies. Later we approached within a few feet of them while their parents yelped offshore, and finally they reluctantly slipped like little brown sausages, into the sea.

We hiked along the beach eastward and finally came out at the sand spit at the far end. As I rounded the last point I could see three or four chuckwallas clambering off the beach and up the rocks into a boulder-filled swale. We caught three or four and I decided this was the place for an observation station. There are many animals and they should be easy to observe.

On down at the sand spit I saw a big old chuck lumbering for the rocks across the sand. I raced him and won just before he reached the rocks. With an armful of sea lion skulls for Art Kelly I began the trek back over the boulder beach in the baking sun. Both Bill and I were fagged and steaming hot as we arrived. Quickly we all went for a dip and then returned to the boat. I told the skipper we were through and we upped anchor and returned uneventfully to L.A. Bay, where we arrived at 4:30 P.M.

August 7, 1961

Los Angeles Bay

Not much today but a collecting trip south of the station which produced among other things, a *Dipsosaurus* intergrade between the Colorado Desert form and the Baja form.

We had burro meat for lunch and lobster for dinner and are rotting in the tropics.

After returning to the station we sat on the veranda in the heat of the still evening watching the lightning across Angel. Before long it began to move closer and flashed so often it looked like a pinball machine in full spate. I bet that it would not reach us and about ten minutes later a breeze hit us and the clouds began to blot out the sky overhead. Ten minutes more and the sea had become all white with breaking waves and scudding spume. The wind slammed doors in the station and blew gear boxes over and carried spume up across the veranda and into the sleeping room. Headlights flashed on from the beach and revealed boats heaving at anchor. One washed ashore and we could see figures on the San Antonio II pacing back and forth as she got underway and battled forward away from shore against the sea. We thought of her disabled engine and wondered if she would make it. It was a wild scene.

The wind began to shift toward the south and soon came from offshore and it was all over. Very exciting while it lasted and now the rains began to fall in earnest and we went to sleep with it tapping on the veranda and roof.

August 8, 1961

Los Angeles Bay

This day spent collecting south of the village along the bay edge and on some isolated lava mountains near the bay. We collected a number of interesting animals and returned in the heat of midday for beer and sociability. John and I went out again in the evening and I spent some time watching chuckwallas in the bedroom (they apparently are drinking salt water).

We arranged gear and caught up on notes in the evening.

August 9, 1961

More collecting near town and down by the saltmarsh south of the town. I ate a sour pitahaya and found it delicious—a little like watermelon.

August 10, 1961

About noon we had packed and were loaded aboard the plane. I sat in the co-pilot's seat (to balance the weight aft). I enjoyed the view of the peninsula as we flew between towering thunderheads. George Lindsay and Wes Farmer met us at the airport and escorted us across the border. Home at about 12 midnight.

January 25, 1962

Enroute to Ensenada, B.C.

After a day's delay with assorted Mexican paperwork we boarded the Lockheed Research Vessel *Sea Quest* at 9:00 P.M. and steamed out of San Diego harbor under drizzly skies. Weather reports predicted a mild storm which did not materialize. Our trip is planned in order to study the sound emissions of gray whales and is sponsored by the oceanographic division of Lockheed.

On board are two of her scientists—Bob Eberhardt and Bill Evans, the Captain Harold Moody and Engineer Wendell Tripp. The *Sea Quest* is a 50-ft. converted salmon trawler and very well fitted out for acoustic studies as well as other oceanographic work. I am more or less a supercargo along as an observer.

I turned in just as we picked up the light on S. Coronado Island.

January 26, 1962

At sea enroute to Scammon's Lagoon

Near dawn we turned into Todos Santos Bay and slipped behind the new breakwater. A few minutes after anchoring a decrepit water taxi showed up and offered to take us ashore.

Ashore we looked for and finally found Pedro Mercado, Director of the Universidad Autonoma de Baja California, School of Oceanographia. He proved to be a very pleasant young fellow who we expected to go with us, but he didn't have orders to do so. Finally we found that we were to take the exec. of a Pc [?], Jorge Lagos Knutze. Once he arrived on board we pulled anchor and left for Scammon's Lagoon. We were well down along the coast when night fell—the seas fairly calm and the ship putting along at a sturdy 7 knots. We passed San Geronimo Island and before the sun set we were in sight of Cedros Island, though many miles to the north.

Enroute we spent our time on deck watching seabirds—murrelets, loons, cormorants, shearwaters, etc. We also noted schools of *Delphinus bairdi*,

Lagenorhynchus obliquidens, and one lone humpback whale. This animal blew 75 yards ahead of us and threw its very broad flukes three times for us. I noted the very narrow peduncle and the funny ridged back that is almost but not quite a dorsal fin.

In the evening, as we entered Sebastian Vizcaino Bay, schools of both *Lagenorhynchus* and *Delphinus* came to our bow and rode, outlined in phosphorescence. One could easily see the turbulence patterns around the animals. Some seemed always present back of the pectoral flippers, though it was greatly reduced when they were brought in close to the body. A streamer trailed from the dorsal fin tip and a broad swath from the trailing edge of the flukes. Elsewhere the flow clung closely to the body, notably tucking in over the peduncle. A most dramatic demonstration of flow patterns over these sleek animals and possibly due to a powerful experimental method.

Later at night the wind and swell picked up astern and we began to pitch strongly. Then the swell changed direction until it was coming from dead ahead. The bucking ship became quite uncomfortable. I lay wedged in my foreward bunk and got up from time to time in desperation.

January 27, 1962

Scammon's Lagoon, Baja California

Up at dawn to find our ship approaching the sea buoy off Black Warrior Lagoon. We hove to and waited until the skipper of a big barge operating in the channel to the lagoon came out to give us instructions on Scammon's. Capt Tielit looked German but spoke with a slight Aussie accent. He told us about the outside bar, cautioning us to go in only on incoming tides and out the same way. He told us we would find Erle Stanley Gardiner camp just inside and perhaps a turtle fishing camp but no more human habitation. We left before 9:00 AM and headed for the entrance. The sea had fallen calm and almost glassy and the sun was bright and warm. The sculptured sand hills were white along the shore. Whales became more and more numerous as we approached the entrance from the east-northeast.

I suppose we saw 30 before crossing the bar at 18 ft. beneath the keel. In the entrance itself we passed a number of whales and a large school of *Tursiops gilli*—I would guess 25 animals. The whales were going in both directions and many threw their flukes and a few spy-hopped. One individual outside the bar jumped repeatedly, almost clear of the water.

The sea fell absolutely calm inside as we skirted along the west edge of the lagoon past Conchos Island. Precipitous interconnected barchan dunes covered the west shore interspersed here and there with weed flats dotted with shore birds and brants. Whales passed to and fro and several were seen poking their heads high out of the water and some seen rolling in pairs at the surface, presumably mating or nursing. An afterbirth was passed to starboard—its attendant gulls rising as we bore down.

One sound drifting station adjacent to Cardiac Island produced nothing but snapping shrimp and croakers even though whales passed close above. We attempted to reach Isla Piedras (Gilmore Island) but had to turn back because of shoal water—a new channel was tried and finally we hove to near this low rocky island. Just after anchoring we put over a fishing line and shortly had a buckful of nice bass of three species. Whales cruised close aboard from time to time.

After a nice ham dinner Jorge serenaded on the guitar and after my 8-12 watch off to bed. Tomorrow we proceed up to the nursery.

January 28, 1962

Ballenitas Channel, Scammon's Lagoon, Baja California, Mexico

Up this morning quite early and after breakfast the dinghy was lowered into the water aft and we piled aboard and rode on to nearby Gilmore Island. The island is low-lying, being perhaps +10 ft. at the highest, and is covered with a sparse cover of pickleweed, and *Fouquieria peninsularis*. The latter bushes are the largest on the island. Some were in bloom and all were draped with a heavy growth of epiphytic *Tillandsia*.

I struck out northward, hiking mostly close to shore. Heavy mats of dried sea grass lined most of the shore, burying the rocks a foot or so in many places. Sea birds were everywhere—willetts, dowitchers?, godwits, oystercatchers, surf birds, black-billed plovers, eared grebes, great blue herons, terns, gulls, and brants were some that I remember. Toward the south tip of the island I spotted a flock of brants and stalked up on them, creeping the last 100 yards on my belly. At the shore I pushed my rifle barrel through the pickleweed and sighted in as well as I could (no front sight) on one bird and much to my amazement, hit it and saw it trail behind the flock and settle on the water 100 yards offshore. It soon died and I took off my shoes and pants and waded out to it, finding it in waist-deep water.

Bill Evans and I hiked back down the island and stopped for a time to listen to the sounds. By sitting quietly on a rock we could hear the gabble of geese—there being a huge flock of several thousand birds just to the north along Brosas Island—but mainly the breathing of whales. This was so constant that often 2 blew at once. Most did not seem to be accompanied by spouts, though some were. The hollow cavernous exhalations could be heard for more than a mile, and usually could be divided into 2 parts—the heavy exhalation followed by a less evident inhalation. Occasionally a gurgle or a snore was heard and once or twice of loud volume. May of the whales involved were resting nearby passively at the surface with just a portion of their backs exposed. Some were obviously paired, young and mother, and some were thrashing about and leaping part-way from the water and may have been mating.

We poked in the tide pools and soon joined Bob Eberhardt who was doing likewise. We found some interesting worms, tunicates, gastropods and the like. After a while we walked over to an old turtle fishermen's camp and poked around. I caught 2 brown-shouldered lizards (*Uta stansburiana*) under turtle shells and the others picked up shells and whale earbones as trophies.

We met the captain and went back aboard where we found Jorge and the captain had been losing hooks and line to huge groupers.

Soon we hauled up the anchor and proceeded farther into the lagoon toward the nursery grounds. Off the south end of Gilmore Island we noticed a small whale floundering in the water on a shoal area and could see a grill walking up and down its body and pecking at something. The little whale rolled on its side and slapped its flukes and flippers at the bird as if annoyed by it. Bob said—"Let's go see what's going on there." I quickly seconded the motion, so we anchored and lowered the skiff and set out to see what was going on. Soon the skiff grounded so I jumped out and hauled it along by the painter. Before long we were alongside the animal and found it barely able to

move in the shallow water. It had obviously been trapped by the tide away from its mother. We could see a crusty old adult in the nearby channel, poking her head up out of the water from time to time. I presume she was the mother, though of course we don't really know.

The little whale's back had been terribly pecked by the gulls and was bleeding over a large area (seeping blood) of the mid-dorsal region and upper flanks. Peck marks were evident over most of the back and one could see where the sharp gulls' bills had been driven in and an attendant piece of gray skin and blubber removed. Other than this painful state of affairs and fright, the animal seemed in good condition. I leaped into the waist-deep water and held the whale's head up. Its snout in front of the eyes was quilted like a comforter, with hair follicles, 56 to each side above the upper jaw and from the center of each grew a long white hair. His eyes were covered by prominent eyelids which caused protruberances on each side of the head. Her tiny ear canals likewise were on top of prominent mounds. Once I saw his eyes and they were the same brown color as a pilot whale's, though I saw no operculum. Over the undamaged portions of the skin were occasional white flecks and patches among the otherwise uniform gray.

In the prominent fetal folds and other body crevices were already thriving populations of whale lice, but no barnacles. I lifted the animal's head and could see the lower lip where it overlaps the upper jaw and the short white baleen within. At the symphysis of the lower jaw I could see a round white dot like that of newborn pygmy finback whales and could see the peculiar highly modular tongue. The animal was a male 14 ft. 9 in. straight-line length and the 6 in. of the umbilicus still trailed from the abdomen.

The frightened little animal usually rose up to blow but occasionally burred beneath the water. When I placed my hand in its mouth at its apex, he grasped it firmly with the bow of the lower jaw and enveloped it with his lips above and below. It would be efficient at nursing and the thin head should slip easily into the mammary folds of the mother. The animal was plump and the rubbery skin and flesh turgid.

We tried to steer it into deep water by hand at first and once deeper water was reached, by skiff. Cap found that the outboard would turn the creature if roared on one side and thence followed an hour or so of whale herding in which we attempted to steer the young animal toward his presumed mother. Just when he was going at a good clip he would attempt to sound by rolling on one side and diving, inevitably bumping his snout on the bottom.

Finally we left him in 4 or 5 ft. of water since we were afraid to venture too close to mother and it was getting late.

Back at the Goat we upped anchor and proceeded into the deepest part of the lagoon, where the nursery channel is located. The lagoon is a vast expanse of water and here deep in its recesses were dozens of whales, some spy-hopping, some just cruising and blowing, and some with calves at their sides.

We felt our way through the various channels, in water that varied from 15 to 30 ft. deep, and anchored at the mouth of the nursery channel. On the west it is bounded by a low sand hummocked shore and low bluffs on the east. Whales were all about and we were delighted to find that our radar easily picks them up. I'm now on the mid watch and must go check the wind, heading, and temperature.

January 29, 1962

Ballanitas Chanel, Scammon's Lagoon

Up this morning a bit drowsy after the 12-2 watch. After breakfast the skiff was unlimbered for some plankton tows and I hitched a ride ashore. I landed on a long sand bar and walked back by a broad pickleweed flat bisected here and there with winding salt water channels and pools. Shore birds were everywhere—I saw 2 new species—black-necked stilt and black-crowned night heron. After reaching shore I hiked for an hour over some hummock beach dunes—only *Uta* was active. The dunes were carpeted with evening primroses and a small yellow composite and were soaked with rainwater.

I met the skiff and returned aboard for lunch and afterward we moved the *Sea Quest* into another channel that seemed more frequented by whales. We anchored fore and aft and silenced the ship's engines. The skipper, engineer, and Jorge went ashore to poke around while we listened for whale noises.

Even though whales played and splashed, mated, and cruised near us we heard nothing from them—only the crackle of the ubiquitous snapping shrimp. Then 2 *Tursiops gilli* cruised up and we could hear the slow popping of their echolocation signals with occasional rusty hinge noises. They turned 150 yards away and cruised off away from us.

We now think gray whales may just be good listeners—finding their way by sight and hearing but not generating any special echolocation signals.

The skiff returned near dusk and Bill and I took a turn in it attempting to get another goose or 2, but no luck.

I fished most of the evening for smelt—caught a few—wrote notes, stood the 10-12 watch, and off to the sack.

January 30, 1962

Ballenitas Channel, Scammon's Lagoon

Up this morning at a relatively decent hour to be greeted by Capt. Moody cooking pancakes and bacon for us all. Once they were engulfed we set about rigging and launching a pole fence. This fence is to block one channel leading up Ballenitas with the hope that whales will turn from it and when they detect it, emit characteristic sounds. Ballenitas has a Y of channels leading into it. We occupy one with the *Sea Quest* and the other will be blocked by poles. These poles are 15-ft. aluminum tubes closed at the bottom and weighted with pieces of chain. They were lashed together at 50- and 25-ft. intervals with heavy nylon cord. Once lashed together they were simply towed into place and anchored on each end. The deepest part of the channel is about 15 ft. deep and we were able to bridge it about 2/3 across with poles. I spent much of my time photographing and finally in rigging the last set of poles.

After lunch Jorge and I went ashore on a hunting expedition. Jorge is a bit of a city boy and not privy to much natural history, though he and his countrymen know much more than the average American about things of nature. We walked back inland, traversing an ancient shell-covered beach and entering an ocotillo forest draped with *Tillandsia*. I spotted a jack rabbit and took a shot which missed. Off went the jack inland and I followed. We went about 2 miles in all over very open country dotted with tiny shrubs. I didn't get my jack and I was just as happy.

I circled down to the beach dune where Jorge had gone with the shot gun. I saw some geese out near the edge of the lagoon and decided to try a stalk. I would guess 300 yards as the distance I covered crouched down (now I know what a “duck walk” is named after). It was mucky whitish almost plaster-like mud that I squished and slid through. Finally I crept up to a grass borderland and found myself in real soup. It squished down with each step and irate fiddler crabs waved from their holes at me. Then I came down a winding channel of tidal water deep in black muck and had to stop 20 yards short of the geese (black brant). Ah well—I didn’t really want a goose anyway. What I really wanted to do was to wear off some energy stored up from sitting on the boat, and that I was accomplishing nicely.

As we wandered back down to the beach I saw a whale steaming toward the picket fence of poles. Jorge and I stopped and sat down to watch. The 40-ft. hulk slid along with a long low expanse of black back just above the water, blowing now and then. He steamed right into the poles with a great clatter, turned over with a pole in his mouth, turned back and went back toward the sea at flank speed, puffing in fright. Later we found that the whole sequence had been picked up on tape and the animal made no noise other than breathing and that it had broken the nylon line. We feel relatively sure now that these huge hulks do not have sonar as such, but are probably just “good listeners”. A couple of other whales went through while we watched. We now suspect through the gap produced by the first animal.

Back on board Bob decided to take a run up Ballenitas in the skiff and I tagged along with Bill as the other passenger. Just above the net we came upon a crusty old barnacle-covered mother whale and calf. Soon we realized the mother had a badly deformed tail stock, bearing a deep indentation along its upper border. Somehow she seemed to swim well enough and to bear a calf.

We came upon 4 or 5 other whales including calves as we cruised along in calm waters between low barren bluffs. The sun was setting as we returned, the clouds turned pink, and the hills dark blue while the vast lagoon shone like silver in the fading light. Here and there the tall plumes of spray marked a whale’s presence. The trim little *Sea Quest* lay quietly anchored in the middle.

On board we had a magnificent dinner of steak, peas, salad, red wine, and pie. Afterward Bill and I stood on the fantail listening to the whales blow all around us. The ship was silent as Wendell was fixing a fuel line and had shut off the generator. We thought one of these animals might even run into us, but none did.

Their blows have the deep hollow sound of air rushing from a deep cavern.

Shortly I went below to get enough sleep for my 4-6 watch (on which these notes are being written).

January 31, 1962

Channel between Isla Piedra and mainland, Scammon’s Lagoon

Whales are blowing close aboard on all sides of our anchored ship and it is 1 AM as I write these notes. I’m on anchor watch and pretty sleepy. This morning we ran a sound station and Bill picked up some strange, deeply resonant bubbling as a whale passed close above his distant hydrophone. He also caught a couple of snores attributed to the whale. I spent much of my day reading about our incredible navy debacle at Savo Bay.

Around 2 PM we brought in the pole barrier, stowed it aboard, and heaved up both and headed for a supposed calving grounds across the lagoon to the southwest. We simply couldn't find the entrance channel and finally abandoned the attempt and entered the broad channel between Isla Piedras and the mainland to the east. It proved to be full of whales, many seemed to be passing us by in either direction.

We beat up it to near the south end of the island and anchored fore and aft in a stiff current just at sunset. After dinner we went on silent ship and began listening to the whales. We recorded a whole series of deep resonant bubbling and burbling sounds, snores, and irregular series of sharp ragged plosive noises which as Bill so picturesquely puts it sound like "a poor man's *Tursiops*".

We listened and recorded for nearly 2 hours and were seldom without some noises being produced. All is quiet on board now except for the puffing and splashing of the passing whales, many of which pass within 50 yards or so—one is about 40 ft. out right now.

February 1, 1962

Up this morning at 7 AM and after breakfast and various machinations with the fence which was set to the left of us, Bob, Jorge, and I went ashore for a recon trip looking for the small whale which we thought we could see on the beach. When we came close our sighting proved to be a rock but we set out to do a little exploring. I set out with the shot gun on the mile-long sand bar to the south of the island. It is a mosaic of mud flat, *Zostera* beds, and dotted with shore birds of several kinds—long-billed curlews, willets, dowitchers, marbled godwits, etc. Black brant gabbled in large flocks and tip upped in the *Zostera* beds. As I walked out whales spy-hopped in the channels only a little way offshore—so close that it seems impossible that a 35-45 ft. beast could be in deep enough water to float.

In the pools flat fish and rays skittered in front of me as I sloshed along and I could see a number of interesting invertebrates and red tunicates, tectibranch egg masses, and the like. Then I returned to the island and set out looking for stranded whales. I found ours near the north tip of the island, very dead, and very bloated.

After hiking on around the island on the mud flat I met Bob and Jorge and I told them about the whale. Jorge had seen it and Bob at once decided to get measurements. We pulled the skiff out over the flats and beat up the channel, having a soggy ride of it into the wind.

We finished measuring as the light faded and soon we jumped aboard and headed for the *Sea Quest*. We dodged among "whale footprints"—the tail beat slicks. We reached the ship in pitch-blackness to find Bill chortling over some nice recordings he had taken of *Tursiops* around the poles. When they saw the poles they squeaked and whistled in a most satisfying way.

A little dinner, some listening, and off to bed.

February 2, 1962

The skipper, Bill, and Wendell set forth for the mainland shore after breakfast and walked up and down the beach, finding very little but an old TV tube for their pains. I took a batch in a bucket on board and fished, catching an [?] (*Paralabrax auroguttatus*).

After the boys returned we upped anchor and pulled in the fence and headed up the channel toward Las Brosas Island. Bob decided that he and I would put ashore and camp overnight, looking for stranded whales and cetoliths while the others went over to pick up Bill Kielhorn whose plane circled us and landed at Black Warrior.

By about 3 PM we were abreast of Las Brosas Island and we shortly piled in and anchored off the middle of this long sandy island.

Bob and I loaded our gear into the skiff and Capt. Moody ferried us ashore. We landed on a rocky headland and soon had our gear above high water next to a little sand-rimmed embayment filled with dried *Zostera*. Pickleweed flats spread out shoreward gradually giving way to monotonous sandy flat terrain, punctuated here and there with 8-10 ft. sand hummocks.

Very shortly we set out to reconnaissance the coast for whale remains. I went south along the west shore while Bob went north. My walk took me past a juvenile whale a couple of hundred yards from our camp. We named him Bradford and Bradford was in a bloated condition and was feeling very poorly and smelling worse. On down the coast I passed many mud flats and sandy bays and finally the island became lower and lower until it consisted of a sand bar backed by pickleweed flats. All kinds of shore birds marched along probing the mud with their bills, or simply standing on the beach.

Finally at the very southernmost tip I could look across a great 3-mile *Zostera* flat to Piedras Island. A bar and tiny island rose a few feet at the middle. I rested for a few momets and began hiking up the east coast and soon came upon another whale far out on the flat. He was covered with seagulls standing on his back. I took off my shoes and paddled out to him through the pools. It proved to be another male, also a newborn, but a bit fresher than the last. We named him Cedric. The sun was getting low and I wanted to find camp in the light so I hurried off up the beach barefoot—fording various run-off channels from the interior pickleweed flats. About halfway up I put on my shoes and set out overland to cross the island toward what I hoped would be camp and came up to it just as it became quite dark. No Bob—so I gathered driftwood and soon had a beacon fire blazing. I swung the battery lamp around in arcs across the island and shortly heard a shout—from the wrong direction. It proved to be Bob all right and he soon strode into camp. We both flopped down by the fire and soon began broiling pieces of spam on driftwood sticks in the blaze. Gad—did it taste good. Crackers and fruit juice topped it off and we soon crawled in the old sleeping bags on our mattresses of dried *Zostera* and drifted off to the gagging of geese (brant), the yapping of coyotes, and the breathing of whales.

February 4, 1962

Isla Las Brosas, Scammon's Lagoon

When I woke this morning at dawn there were about 10 brants cruising up and down in front of camp, dabbling in the eel grass. I tried to reach the shotgun and thought better of it, wondering what it would be like to have a 12-gauge blast at 20 ft. wake you up. The geese flew in minutes and I dressed quietly, grabbed the gun, and crawled about 150 ft. on my stomach up to some pickleweed lining the edge of the shore, poked the barrel through, and [?] up on some geese 75 yards away. I fired, they rose and flew effortlessly off. Since I was firing buck shot from a prone position I can't fathom it. I set off for a before-breakfast hike and crossed the island to the NE. One of the first things I

found was another whale stranded on the bar. It was a female and became christened Alice. An hour or so later I returned to camp where Bob announced that corned beef was to be breakfast. I cut open a juice can, made a flat sheet of metal by cutting out the ends, and then folded it into a frying pan, which Bob used to fry our beef. After this and a little fruit juice we set out for Alice across the island. About in the middle of the island we came into some patches of a peculiar looking *Opuntia*. Its stems were unusually knobbly and its fruit a rather dirty tan. I tasted it and it had a rather astringent quince-like flavor, not very sweet, but quite edible.

Two other kinds of cactus were to be found—a *Mammillaria* and an *Echinocactus* or *Ferrocactus*.

At Alice we set about measuring and finished in fairly rapid order. We found that we could lift out the entire baleen plate row for a ramus of the jaw by prying on it lightly. This greatly facilitated us in counting the plates. Alice had been attacked by sharks. Her tail was bitten down to tendons and bone and her flukes were missing some arcuate pieces.

Off to Cedric. He was a long way off at the south end so we hiked partly up on the dry center of the island where the going was easier. We reached the flat where I thought Cedric should be, but no Cedric. We walked clear to the south tip and still no Cedric. Finally we saw him out on the flat about $\frac{1}{2}$ way to Piedras Island, covered with a fleet of gulls. We pondered for a while but the way was too far (perhaps a mile) and our time too short, so we turned toward camp. It was a long, long walk (8 miles), much in soft sand or mud. Finally at about 2:30 PM we made it—cooked and ate our spam for lunch and went to work on Bradford. I tried unsuccessfully to extract an ear bone assemblage but was thwarted by rotten flesh and the hidden position of the bone.

Before the *Sea Quest* returned for us I spotted some geese nearby and decided to try a difficult stalk to see if I could get a shot—it entailed crawling across about 80 yards of wet sand and mud to a rocky ledge on my belly. When I was $\frac{3}{4}$ there, afraid to lift my head, I heard the brant rush from the water chattering and quacking. I looked up and there was the cause—a hawk was clutching a dowitcher, having swooped on it right in the midst of the geese.

Meanwhile the *Sea Quest* had arrived with Bill Kielhorn and Ray Ells on board—they had landed at Black Warrior in their plane. We went aboard and had a beer and set out in the skiff for Cedric on the mudflat. 30 minutes later we found we would have to hike $\frac{1}{4}$ mile across the flat and did so, hoping to get our measuring done before the tide rose. We measured him quickly and started to hike back, exploring a little sandy island on the way. When we returned it was sunset and I was getting cold in my thin shirt. A kapok life jacket helped this some and we cruised out into the channel toward the *Sea Quest* anchored near Piedras Island.

Bat rays, guitar fish, dozens of round stingrays, and one huge diamond stingray rocketed from our bow. We ran repeatedly aground and finally found a channel leading down near the *Sea Quest* only to find ourselves separated from it by a shallow bar.

We pushed with oars for what seemed like $\frac{1}{2}$ a mile before reaching deep water astern of the *Sea Quest*. Shortly we were on board engulfing a big dinner.

I am now reclining in my sack writing and resting my weary bones.

February 5, 1962

Mulege, Baja California Sur, Mexico

Little did I think that this day would end up in a plush sky motel at Mulege, some 150 miles from Scammon's Lagoon. First thing in the morning we hauled up the anchor and set out into the deep westernmost channel heading toward the entrance. Our goal was to anchor near the dunes by the entrance. As we cruised up the lagoon we spotted a new stranded whale on Cardiac Island, clouds of gulls swarming over it at the edge of the water. Bob decided we should measure it and we named it Douglas. I concurred heartily since we were both anxious to get as much data on newborn animals as possible. Soon the anchor was down and Bob and I were ashore with notebooks, tapes, and measurement sheets. Before we had made our landfall Bill Kielhorn had spotted a floating object which turned out to be another whale—very newly dead—in fact it was apparently still warm. We towed it in by one flipper and beached it and named it Evangeline. Just as we had gotten ourselves organized the ship's whistle let out a loud R in morse code. Bob instantly recognized this as "rescue". I would have listened to R for a week and not connected it with rescue. At any rate, before we could do more than get total lengths the skiff cut toward us as fast as it could go, and sure enough, it came to us because a plane was reported down up the bay, and two of the fliers were reported seriously injured and two had walked overnight into the Black Warrior salt works for help. Back on board we heard the measured tones of Capt. Tillit on the radio telling us that if we could make a rescue attempt and bring our pilot over to the entrance to the Nursery (White's Waters) we would be doing a jolly good service. So up came the anchor and we were soon threading our way down the bay again. After about an hour and a half or so we pulled into the narrow channel of the Nursery and came to anchor. About that time we could just make out figures walking up and down the beach below the east bluff. Soon we sent a skiff over and landed. Much to our surprise we found the two supposedly injured parties standing on the beach with pants legs rolled up, entirely intact, surrounded by a crowd of people from the salt works. The manager, a grizzled old man named Cutting, was there and soon loaded us all into his jeep pick-up and headed for the salt works. The plane, an Apache, was across the channel on her back. Her nose wheel had dug into the sand on the landing and flipped her.

One of the fellows in the plane was a land developer from Phoenix—his name was Paul something or other, another owned a couple of cement plants near Nogales, and the other two I didn't meet. They were fishing and just fooling around, having decided to leave only the day before in Phoenix. They seemed not at all concerned about the plane, and I doubt that they plan to try to flip it over and salvage it, though they say it isn't badly damaged.

We drove across a flower-dotted desert to the upper head of Scammon's which served as a reservoir of partially evaporated water for the salt works. This saline water is drawn off into Black Warrior, spread among salt pans and finally brought to crystallization. The works is a fantastic operation. They make as much salt in 180 days as the Leslie works in San Francisco does in 5 years, and all because of the desert sun which beats down almost always. The salt is scraped up by big motorized machines which dump it into 100-ton carryalls. It is quite pure when lifted from the flats. Most goes to various chemical plants—much to Japan, a fair share to British Columbia.

We crossed some of the flats and finally reached the company village—a soulless assemblage of flat-topped houses set in lines on the flat desert adjacent to the ponds. Mr.

Cutting put us up in two of these—nicely equipped with showers, stoves, ice, etc. A rather remarkable state of affairs in this remote desert. The water comes from 4 wells about 6 miles out of town on the alluvial fan. We learned that there was a little satellite village about 3 miles out of town where there were bars, cantina music and where the “girls” held forth. In a place such as this the “girls” are accepted as a sort of service function, like water and power, and it must seem strange to the Mexican folk to find them barred into an exterior community.

A few minutes after we arrived, Bill Kielhorn came in in another jeep and shortly we decided to fly over the lagoon and see where the *Sea Quest* was, take some photos of the channelways, and to see if we could see the downed plane. Up we went with no doors on, so that photography would be easy. From the air we could see dozens of whales in the lagoon, many very far up it, even a couple of miles beyond the nursery. We saw the plane in the middle of a long stripe of windblown sand that a novice could have mistaken for a strip of hard soil, and we flew over the *Sea Quest* making her way back toward Cardiac. On the way back Bill flew low over the dunes trying to scare up a coyote, but no luck.

Shortly after landing Bill asked if we would like to spend the night at Mulege across the peninsula, and we all said OK, let's go. Into the plane once more, after our goodbyes were said, off down the runway and into the air again. Our course took us across the Vizcaino Desert which is lined with very regular and very elongate parallel humps of land that must represent old sea level lines. They extend all the way up to the foothills, and trend roughly north and south. Before too long we crossed over the great arroyo of San Ignacio, and could see it winding out over the plain to San Ignacio Lagoon. It was gleaming with water, like a line of mercury shining in the afternoon sun. I could see the plaza and the old Jesuit church and the sea of date palms in the arroyo. What memories it stirred to see that wonderful sequestered spot again after 12 years, even if from the air.

Shortly we headed right into the rugged Sierra Santa Lucia range. It is a jumbled mass of volcanic bluffs and cliffs, deep dark canyons, and unknown arroyos. On its peaks are some of the few examples of short tree forest in Baja California. It is a refugium that has been examined only by botanists as far as I know, yet it is likely to hold the key to the animal history of Baja since it was once an island and dominated the entire center of the peninsula. I will have to pack in some summer and explore it firsthand, that is for sure.

Before long we dropped down over the Gulf and over Mulege. It is a beautiful place. The freshwater stream pours down and meets the sea, banded on both sides by mangroves and cultivated gardens filled with sapotes, avocados, dates, grapes, and citrus fruits. The field is something else than regal however. It is tucked behind a hill and is very short. Bill expertly banked in past the hill, slipped in, and set down without a hitch. To our left was a nice “Airtel” or hotel where mostly pilots and their passengers put up. The accommodations were very nice though we found when we left that the prices were a bit steep.

February 6, 1962

About 8 we crept out of the sack and after breakfast took a walk up town. The dusty road passed along the lagoon edge, up into town and then along the stream amid

groves of palms. Shortly we came to the old mission. It had been one of the first in Baja, being a visita of the initial one at Loreto. I would guess it had been established around 1700. We walked around it and finally slipped into the main room, where the altar surprised us with its statuary and encrustations of gold leaf. Some of the very old paintings of saints and Christ were hung around the walls and the ceiling was painted blue with gold stars scattered about, peeling in many places. On the walls were some quaint old kerosene lamps with a long curved neck and a globe-like oil reservoir. It was obviously still in use though we saw no one in residence.

We left the church and walked down to the dam which retains fresh water for the town. While we were walking across it we noticed a great whirling mill of frigate birds swooping on the water of the stream above the dam. We watched closely to see what the birds were doing. I would guess there were between 50 and 75 of these sepulchral, thin-winged birds milling around. Each one would swoop down on the water and glide in awkwardly with his head up, splash into the water without losing headway and take off again, fly up into the air perhaps 50-75 ft., shake his wings, and then shiver his whole body like a belly dancer. This so destroyed his aerodynamic soundness that he then fell several feet before flapping and picking up speed again. Obviously they were bathing and not drinking. We watched for a long time to confirm this and did so without much question.

We returned, packed, paid our astronomical bill, and took off grumbling about tourist traps. Those thoughts left us soon enough as we flew up the coast and saw school after school of large fish, porpoise and finally 4 huge finback whales swimming southward in echelon just off a hamlet named San Lucas, 80 miles or so south of Los Angeles Bay. We circled low and could see the white chins and even saw what looked like white markings on the pectoral flippers. The critters looked much thinner and much longer than the chunky gray whales.

We cruised down the backbone of Angel de la Guarda Island looking for palm trees which I had heard were in some of the canyons. Except at the extreme northern end we saw nothing that looked like a palm or water, and even there what we saw was equivocal—some greenery tucked down in a curve in a narrow stream. We flew over Isla Granito and it looked very barren and austere.

We hopped over the San Pedro Martir range and could look down on snow-covered meadows and could even see deer tracks up the smooth white slopes in places. After a short stop at Tijuana we landed at San Diego. I was poked for small pox, my certificate having run out, and our fine trip was over.

April 2, 1963

San Esteban Island, B.C.

Left L.A. Bay at 7 AM on board the *St. Augustine I* for San Esteban Island. Our crew consists of myself as FL (Fearless Leader), Phyl Norris, Sue Norris, "Kelly" Klain, Jim Heath, Dick Lockwood, and Karen Fall.

The trip took the day until about 4 PM. On the way we passed along the mouth of San Rafael Bay, around the south end of Angel de la Guarda Island, south of Isla

Cardeosa (Partida) and past Isla Raza. Partida is composed of 2 peaks and seems very barren. Raza is very low and seems completely barren.

We were far enough away so that it was difficult to tell if birds were nesting or not. Before we reached these islands about ½ a dozen common dolphins came to our bow. They seemed identical to our California form. Before long we passed north of San Lorenzo Island. Its east coast is obviously a scarp as faceted ridges drop abruptly into the sea. Between San Lorenzo and San Esteban we spotted several finback whales and watched them blow and surface. We rounded the island and cruised toward the SE corner. Before this we had seen at last 3 Heerman's gulls with double white primary patches.

Finally we hove to a open cove, bounded on the S. by an isolated rocky knob harboring its inevitable osprey nest and an alluvial buff to the north. Between, the main arroyo of the island curves down from the mountains. The island is not high anywhere, reaching perhaps 1,200 ft.

We made camp against the alluvial bluff—hauling gear up over the rough cobble beach. Darkness set in soon after dinner and we settled in for the evening. The night was cold and windy—perhaps dropping to 45 deg. F. The channel had whipped up and when the skipper (Leopoldo) and his crewman (Nayo), came ashore to leave us some reserve water (we have 70 gallons for 7 days) plus their 13, they told us that a storm (NW) was upon us and might last 3 days or so. The temp. is low enough that any animal activity is doubtless cut down. When I got up at about 7 AM Kelly was coming in from a hike and had spotted 2 *Ctenosaura conspicua* under a rock. Before long we had spotted a couple of *Sauromalus barius*.

The entire arroyo bottom is covered with tracks of these lizards. Everywhere there are boulders with shallow burrows under them. The arroyo is densely vegetated with a large cardons, several kinds of opuntia, dense patches of pitahaya, *Simmondsia*, *Hyptis* (in bloom) and various lower shrubs. The arroyo walls are a jumble of desert varnish-covered boulders rising to old crumbling flows at the tops of peaks.

I prepared to go out on a hike from camp and in the bush next to our tent I captured a racer (*Masticophis bilineatus*). It was in mottled shade. Its head was considerably warmer than its cloaca. Later Jim caught a large one and saw another.

In the afternoon I walked up on the bluff N of camp and came upon a very large *S. varius*. I walked closer, bent down and picked the animal up by its tail, and only then did it begin to struggle. I took its temp. I set it back on its rock and it ran into a pitahaya. I walked over and picked it up again—remarkably docile. Of the *S. varius* we took today I took fluid from the lateral sacs.

The slopes are pocketed with burrows, probably mostly of *S. varius*. Some were large—10-15 ft. in width and leading off in 2 or 3 burrows, probably running back as far as 15 ft. or so. *Ctenosaura* was also seen in the smaller sorts of similar burrows (and under rocks).

All in all, the weather has been too cool for extensive activity. Chucks were only seen at the entrances to burrows, in the early stages of warming, or under rocks. No feeding apparently took place. Tomorrow we will go up the canyon in hopes that the narrow situation there might produce warmer temps. in localized pockets.

The evening was spent [?]menting a big chuck and recording from her. Finally, Kelly attached an extra antenna and we were able to get a clear range of 150 ft. The night was blustery and cool and an ominous cloud blanket covered the stars.

April 3, 1963

San Esteban Island

I got up this morning very stiff and a little sleepy as Kelly and I monitored the chuckwalla a couple of times during the night. The signal came in loud and clear. I stretched a bit to break the kinks loose and took off up the canyon. I found a nice chuck under a rock in the canyon bottom.

Back at the camp the girls had whipped up a good pancake breakfast. After we were thoroughly stoked Phyl and I set off up the canyon. We followed the main wash probably $\frac{3}{4}$ across the island. The canyon is rather densely vegetated with a variety of plants such as palo verde, ironwood, *Hyptis* in bloom, milkweed, *Simmondsia*, a plant that looks like *Simmondsia* but has round purple berries, and beautiful cardons and patches of pitahaya cactus.

We picked up 12 chuckwallas and a couple of spiny tailed iguanas. The chucks were all in completely inadequate burrows, either in the canyon bottom under boulders or along the rocky banks of the arroyos. One gets the idea that these lizards have a deep commodious communal burrow usually in the canyon bank and a wide series of temporary shelters under boulders varying from totally inadequate to cover the whole animal to nearly impregnable fortresses under big boulders. Nearly all in which I caught lizards faced SE or S and the animals were all docile and could be pulled free with little trouble. Phyl and I stumbled back under our burdens, plopping down wearily.

Kelly and Jim returned a while later shouting and clutching 8 lizards that they had hauled from a single rock $2\frac{1}{2}$ ft. long and 18 in. thick in the midst of a pitahaya and mesquite. There were 4 chucks and 2 spring-tailed iguanas.

Later in the afternoon several of us went up to an osprey nest that Karen had found just north of camp on a vertical bluff. The mother screeched over our heads but did not stomp[?] on us. Father, so we assume, stayed away and was clutching a fish in his claws. There were 2 nearly naked gray babies in the nest, lying quietly on their precarious perch. Mother soared and swooped in the stiff breeze that is whipping the channel and keeping our temperatures low.

Dick is a bit under the weather—we hope it is fatigue.

April 4, 1963

The wind has abated somewhat. Kelly and I instrumented a large male chuck and placed him under the rock from which I captured him, about 400 ft. from camp in the middle of the wash. The animal raced off with his pack on his back, broadcasting his cloaca temp. We took a couple of readings as the morning progressed.

Dick had gone off for an early morning hike up the creek and did not return by 10 AM. We began to worry as he had been sick the day before and we didn't expect him to be gone so long. At 10:30 I organized a search. Kelly, Jim, and I took separate ridges while I sent the girls up the creek. I hadn't gotten beyond the top of the ridge when Sue yelled up at me and Dick appeared. I called Kelly and Jim off the ridge.

I clambered back down to camp and was surprised to find Phyl and Karen missing still. So, after taking a drink of water and tossing a couple of bags of raisins in a sack, Sue and I set off after them. We hiked and hiked and called and called but could not catch them. We went past the bat cave, up to the place where the canyon widens. We looked for tracks and could find what looked like faint ones, but we couldn't be sure. At last we turned back and finally arrived hot and panting—no Phyl and Karen. They came trudging wearily in about 2 PM, thirsty and tired.

Our lizard had been resting under the same rock and his temperature went up and up. Finally he disappeared and we could pick up nothing.

Just before dusk a plane came over that we were pretty sure housed Charlie Lowe, Dick Felger and pilot Ike Russell. The plane circled and a small parachute fell loose dangling a small package. It drifted over the sea and sank. The plane circled and circled and finally another parachute bust loose and drifted stopping just into the surf. I sauntered over and picked it up. It read: "Ken, if you get this, we will land on Tiburon and hike to the beach and make a fire. Can you come over and pick us up tomorrow." Obviously Charlie. With our boat out of commission (the starter spring is broken) we have no chance of going out to pick him up. After dusk we watched ruefully as a blaze appeared along the Tiburon coast.

Later, everyone but Phyl and Dick piled in the boat and went langosta hunting. The water was clear and we saw many and took some nice ones with our "Revenilon[?] Grabber". There was much shouting and splashing and order-giving and we finally came back to camp and hit the sack in the calm moonlit night.

Up this morning with plans to do a fish poisoning station off the rocky point of the bay. While I was changing my clothes I noticed a pair of boats coming towards us from Tiburon and almost before I could get back to camp they had materialized into two swift power boats. Sue peered through the telescope and shortly Charlie became obvious, standing in the bow in a bright red coat and Mexican sombrero, smiling like a six-foot-four chipmunk. In a few moments we were wading in water alongside the boats greeting Charlie and Dick Felger. They had flashed the boats down with a mirror from the beach. The fishermen were a sullen crew, unhappy at being dragged out of their way and away from their fishing. Finally Charlie jumped ashore and before long we were up looking for rattlesnakes. There is a single form on this island—a pygmy black-tailed rattlesnake of which only 2 specimens have been taken. Charlie, Sue, and I took off up the left-hand draw poking in among the rocky outcrops. We took some *Cnemidophorus*, a baby *Ctenosaura* and some utas.

As we climbed up the steep talus slope we began to see baby chucks sunning themselves on the rocks. There were scarcely any adults to be seen. The young animals were wary and not unlike chucks on the mainland. We took a series of animals varying from young-of-the-year to ½ grown. We saw only 2 adults. It seemed obvious that the young were relegated to the slopes while the adults were concentrated in the heavily vegetated washes below. Probably there is slim pickings for the adults on the relatively barren slopes.

Far up the north-facing slope of a talus-filled canyon, about 50 yards from the crest, I was rolling some boulders looking for a baby chuck when a flake fell off and there was a black *Phyllodactylus xanti*. After a chase the little beast ran into my shoe and we captured it. We think it is the second record for the species—the first having been

made early in the century. We drank the canteen dry and slipped our prize inside. We hiked on back down the ridge and finally into camp hot and foot weary. After lunch Charlie's boats returned and he left to Kino Bay and home. Dick stayed with us to collect plants and will return to Los Angeles Bay with us.

After dinner we went out after lobsters again and caught 6.

Kelly and I instrumented another chuck and put her out in the middle of the wash.

April 6, 1963

Kelly and I spent the morning recording from the instrumented lizard. She moved 265 ft. and came to rest under a bush. We recorded her as it sunned and then as it controlled its temp. and retreated to the shade. Dick Felger reported seeing the most chucks at the heads of canyons where draws dropped down into them. These are places of dense vegetation. He also saw one in cholla (whose name he will supply), apparently eating flowers. The chollas are covered with greenish yellow blossoms. Not long after Dick returned from his hike we saw a big Guaymas shrimp trawler in the distance toward Isla Turners. It came closer and closer and finally Sue said "There's Charlie on board". We told her she had a Charlie fixation—but the ship kept coming and before long we all could see the big red-coated figure in the bow, smiling out from under his hat. Before long he jumped into the skiff and came ashore. He had hitch-hiked a ride at Kino Bay and they were to take Charlie and Dick and gear to "Ensenada Blanca" on the W side of Tiburon. After some palaver the men took Dick Lockwood out to see a sick man while Charlie got his gear together. Goodbye once again—this time with instructions that if Charlie was picked up on a schedule by his pilot the plane would make 2 figure 8's over our camp. If we didn't see this we would go to Ensenada Blanca on Monday and pick them up. OK—so off steamed Charlie and Dick with an emergency supply of our food in case they got stuck.

In the afternoon we did a fish poisoning at the south limb of our cove. The bottom was covered with cobbles and larger boulders and the water cold. I spread emulsifiable rotenone around by hand in a dense white cloud. Dick and Karen patrolled the deeper water in the skiff while the rest of us worked the shallower parts on foot, wading up to our waists. The collection was not a large one, mostly Trypterygid clivids, clingfish, blennies, and gobies, and *Ogilibra* of at least 2 species.

Lobsters began to come up and swim around having been driven from their crevices by the rotenone. We caught 15 or so and assured ourselves of a good supper. Everyoe collected as long as the cold would allow and then turned back. Phylly and I stayed longest and walked back along the cobbly beach together. Phyl showed me some bright red mites crawling over the sub-tidal boulders. One wonders what they do at high tide.

Back at camp I ate my portion of an apple pie that Sue had whipped up. Jim stoked our campfire and struck up a few good songs. I hauled up the beer buoy out of the cold bag and we boiled up the lobsters. What a feast under the bright desert moonlight with the flat calm gulf shining offshore.

April 7, 1963

Our last full day on the island. I wanted to get a size series of chucks and so Phyl, Jim, Sue, and Kelly, and I took off up a rocky talus slope to the west of camp. Our

previous surmise seemed to prove correct. Adults are in areas of heaviest vegetation while young and juveniles are in areas of lesser cover and food supplies. We caught quite a few in the course of climbing to the top of the mountain. It was hot and we were dry and tired by the time we sat down under a gnarled ironwood tree for a drink. Many of the chucks have their faces and chests smeared with an amber-colored gum of the *Jatropha* bushes. I suspect they are eating the leaves.

As we walked down the wash on the way back to camp, Kelly spotted a big *Ctenosaura* running on a boulder. We sneaked up on it and I got some good photographs before he took off through the ironwoods. Finally Kelly and I cornered him up an ironwood and I grabbed him. Later he bit Kelly rather severely on the hands.

We have quite a pile of lizards building up. The cave under our tent is a squirming mass of bags.

Kelly, Jim, Dick, and I decided to photograph the osprey's nest at the tip of the point at the south limb of our cove. The nest is on the very tip of a rocky vertical-walled bluff. Mother osprey and one baby were in the nest. While she swooped overhead giving her piercing repetitive cry, Jim crept out and took the temperature of the panting baby bird (41 deg. C). The mother bird swooped and wheeled overhead, twice going down to the sea surface and dragging her feet in the water. Presumably she may have normally used this water to cool her babies. Her wheeling circling flight, her tacks in the wind, her instinctive adjustments of wing and tail to the vagaries of the air currents made a beautiful picture.

After dinner (the girls have been providing superb food) we decided to go out after geckos. Sue and Phyl and I went up an arroyo SW of camp. As we wound around in the rocky walled canyon in the moonlight, peering in the crevices and on the bark of trees not a gecko was to be found. Finally we spotted one and caught him on a large cleft rock. On up the canyon we went through the large ironwoods and mesquite. Finally we returned to camp and began to pack some gear for our departure on the morrow.

April 8, 1963

Los Angeles Bay, Baja California

From 7 until 10 AM we packed camp and moved our gear down to the beach. At 10:30 the *San Augustine* I came around the south point and we began to load. Kelly and I took a quick bath in the ample fresh water we had left (almost 40 gallons). With the gear stowed below we hauled up the anchor and started around the island. At the NE end we stopped dead in the water and Leopoldo and Juan (Nayo was on a three-day drunk and not feeling well) went below and did mysterious things until the engine started again. We passed through a series of very turbulent tidal rips until we cleared the island. Between San Lorenzo and Raza we saw the tiny fin and great dark back of a finback whale and later a school of 75 common dolphins.

We passed to the north of Isla Raza, close aboard. It is low and rocky and has a shallow bay in its north side that can harbor skiffs and small boats. About 10 men were on shore gathering tern eggs. As nearly as I could tell only Heerman's gulls and terns were using the island when we passed.

Amazon Trip—1967, page 1
Northwestern Hawaiian Islands—1971, page 17

Amazon Trip
March 15, 1967

Phylly drove me to the airport where I first learned that my bags weighed in at 125 lbs., and then boarded a jet to Miami. The overweight is no problem in the USA, but will become so out of the country. Two hernias later we got the bags on board a Varig flight for Belem. The last light of day faded as we crossed the SE corner of Cuba. We landed at Caracas—hilly country with warm humid tropical air. In a few moments we were back aboard and on our way to Belem at the mouth of the Amazon. It was 3:30 AM as we landed and prospects were that my flight up river wouldn't get off until 12:30 PM. I commiserated about all this with a fine Tucson couple and the skipper of a Norwegian tanker. They were all going to Fortaleza or Recife. Much to my delight I was able to transfer to a flight leaving at 6:30 AM on a fine old DC-3. The two beers I had at the airport, courtesy my friends, weighed heavily indeed and I was caught between the desire for sleep and a desire to look at the countryside. I did some of both. The delta region of the Amazon is an intricate maze of rivers and selva-covered islands. From the air one can see a few familiar trees amongst the forest, but mostly it is a mat of green. The river is coffee-colored and probably nearly opaque. It also is flowing fast enough to produce current rips in many places. I saw many rafts of floating vegetation moving along. The plane stopped five times at little tile-roofed villages, usually sitting on the highest ground available. One such was Monte Alegre, a village built on a rounded hill perhaps 100 ft. above the river level. It centers around a great gracious old church with red tile roof and pastel belltower. Here the vegetation and soil were poor—iron concretions and sand. The vegetation reminds me of the short-tree forest of Mexico.

Finally we dropped down at Manaus and circled it. I saw the boat at the pier and the float plane tied down just off the runway. My meager Spanish was absolutely useless and I had to resort to drawing to get my taxi driver to take me to the ship. The driver played his horn like a strad, giving an impression of great speed and determination, and shortly we were in town. It is a somewhat battered tropical latin town on hilly terrain filled with free-style drivers, old battered buses, trucks full of produce, and people. The Portuguese influence is great here; thin aquiline features and few really shapely girls to watch. At the river boats brought in all sorts of produce—bananas, etc.

Our husbanding company, Booth Line, was a great help. They had two or three English-speaking employees and I was able to get tickets arranged, gear toted on board, and so forth.

The *Alpha Helix* is a dream. A white ship about 120 ft. long, sleeping 22 including a scientific crew of 12. She is magnificently equipped with laboratory equipment, machine tools, launches, animal cages, wardroom, fine bridge, excellent quarters, cooking and food storage facilities, and so on. All in all, just about the most posh floating laboratory imaginable—all air conditioned. I bunk with Ted Bullock, the Chief Scientist, in a nice topside cabin. Other scientists are Dr. Sawaya of Sao Paulo, Don Lindsley (physiological psychologist), Peter Hartline (a young neurophysiologist),

Bob Piddington (same), a chap from Harvard working on neurohumors, and some others I haven't as yet met.

I arrived just in time for a big reception of all the local bigwigs from Amazonas State. Everyone who was anyone was on board eating catered food and drinking a variety of drinks. The mayor's representative, the archbishop, the governor of Amazonas State, a gaggle of generals all resplendent in stars, endless people's wives all dressed to the teeth, a variety of scientists and educators including the rector of the local university, two young American English teachers on their way down the river, probably to Sao Paulo and south, and a young local girl named Sonja, who teaches English and Portuguese here.

The governor, when he found I was a student of porpoises, got a gleam in his eye and wanted to know if maybe I couldn't solve a recent and vexing problem for him. Seems a ballot box was missing from a recent election and the story was it was stolen by a porpoise. Could a porpoise do such a thing? Well, sure, if properly trained. I suggested to him that he should be sure that his party had its trained porpoises, too, to even things up, but this may not have passed the translation barrier. I later learned that it is widely accepted that when a local girl becomes pregnant, she has but to say "a porpoise came and did her dirt during the night" and all is forgiven and forgotten. Handy beasts, these porpoises! Up this way they seem related to goats—scapegoats, at least.

Tomorrow we cast off and cruise about 100 miles up the Rio Negro into an area where all that surrounds us are a thousand miles of forest and the rising river. Several missions are then above us, and then just indians and forest alone. This country is peculiarly deficient in some kind of nutrient balance and does not produce for farming.

The river rises about 6 in. a day now, and will flood over the forest floor for hundreds of miles in places. With it go the aquatic creatures, porpoises and manatees included. It will peak about June and then recedes to its low level around October. Afternoon rains are the rule—skies are dark with thunderheads and I am surprised how cool it stays. I walked for a couple of miles around town with no fatigue—a welcome respite after all my traveling. There is very little evidence of tourists here—certainly few stores feature much to attract their money. Instead it is heavy equipment, pumps, barbed wire, tractors, and automobile parts with the emphasis on 4-wheel drive.

(The travel minister, who was at our reception, says his people work for 4 months, night and day, and then lay off)—clothing and furniture stores, street vendors selling all manner of odd fruit, long bean pods (4 ft), cherimoyas, rose hips, papayas, mangoes, bananas, cylindrical cheeses, sacks of manioc, beans, corn, a variety of milled grains and so on. I was not struck by poverty so much as by the brawling roughness of a frontier and a harsh one at that, difficult to push back, but none the less, being pushed back in a hundred directions. Beggars variously maimed and blindmen were common. Most people bore some mark of the harshness of life in a jungle 2 degrees south of the Equator—smallpox scars, and many were the tough wiry individuals, without fat, arms sinewy and tough. Few over-muscled people but most 5 ft. 5 in. or less.

The seemingly endless forest is their resource, but with its flooding from the rains of a subcontinent, it fights back and progress into it is slow. The rivers are the highways though planes are increasingly important, particularly the old DC-3 and the Catalina flying boat for the back country. For me to drop out of the sky on my short stay points up the schism in life here. Most people are locked to the ecosystem here—the river, the

timber crop, the soil minerals; but some of us come and go on an entirely different basis—based upon the technological necessity of underlying industry with the esoterica of pure science. We are an elite but a peculiar, incomprehensible sacred cow elite making use of unbridled curiosity as its grist. Those of us who are truly curious and not just playing the game sift ourselves out and become the mobile ones, the ones whose curiosity is ultimately supported.

March 16, 1967

Well, we're still at Manaus at the dock waiting for approval for our float plane to fly. Permission is tangled somewhere in officialdom. We loaded fuel today and had not the plane tied us up the fuel would have, as it was stopped for a long time by a broken pump. I spent the day rigging my gear and getting ready for whatever animals we can get. Things are in pretty good shape now. We are building a sort of hypodermic to place the hydrophone. I rigged harpoon lines and checked the gun over.

I took a couple of walks today; one to buy a float for the hydrophone and one to visit the indian museum. This museum is run by nuns, Silesian sect, who operate schools and missions up the Rio Negro. The exhibits were interesting, particularly the basketry and pottery. Much pottery has what looks like stone polishing and scraffito—little simple light-colored patterns across the bowls. I bought a fine blowgun and sole palm darts, and made for the ship.

A tuxuci (*Sotalia*) came up astern of us, but listening was impossible because of noises from passing ships.

After dinner a little more gear-rigging and off to bed—very sleepy in the warmth.

March 18, 1967

After a grand night's rest I awoke more refreshed than I have been for days—a good thing because it has been a full day. About 7 AM the engines of the *Alpha Helix* turned on for the first time since I came aboard, a welcome sound for us all. The float plane still has not been released, but hopes are that it will be free soon. It is greatly needed both for biological reconnaissance and for communication with Manaus. The boat turned up channel in the Rio Negro (the Amazon becomes confluent just below Manaus), and quickly out into the center of the mile-broad channel. As we cut through the dark tea-colored water, I talked with Willy Schwartz, our collector. He is a stocky German of about 55 years who has spent most of his life in South America and the last 20-25 years on the Amazon. He carries on a fish- and animal-export business and owns several boats, rafts, and a variety of collecting gear. He has traveled all over South America, much of it by canoe in the rivers. A fascinating man. I asked if he planned to write his experiences. "No," he said, "I'm still living them. Only if you are unfamiliar and thus a tourist are you amazed enough at the commonplaces of a place like the Amazon to write." Thus, the real experts seldom record their experiences. He pointed out a big leper colony on the south bank; it looked like a New Orleans mansion set amid palms and scattered jungle trees.

We saw several tuxuci (*Sotalia*). They surfaced briefly in mid-channel and disappeared. Their shyness reminds me of *Phocoena*, the harbor porpoise. They stay to channels, Schwartz said, while *Inia*, the boto, will enter very shallow waters.

Parrots flew over with their peculiar low rapid wing beats and flights of the black vulture cruised by, taking 4-5 wing beats followed by a glide. Soon the river began to close in around us and the gallery forest grew denser and taller. Now all communication is by boat or occasional visits from the Catalina flying boat.

At the river's edge it is a mass of different kinds of trees, usually heavily laden with lianas and vines so that one cannot look back among the trees. One could see buttressed trunks standing in water, the feathery crowns of palms and the silvery bottomed leaves of the *Cecropia* tree. This tree, by the way, is the favorite food of the sloths (we have two species on board). From time to time we passed either little frame houses or thatched shelters set on the river banks. Around each area a clearing given over to raising manioc, the staple for flour in the region as it keeps, unlike wheat flour. Usually a scattering of brown naked children scurried down to look at our big white ship, while momma looked up from her work or papa peered out from his hammock. A dugout, or sometimes a houseboat, was tied to the steep reddish bank.

The river itself moves fast and is usually braided out into several channels or paranas, with jungle-covered islands in between. It is rather uniformly about 50 ft. deep in the channel and 200 yards width in our channel.

Several hours upstream we stopped to look at Willy's houseboat which is being considered for a shore camp in the jungle. I thought it would have been excellent—3 big rooms and a half 2nd story, all set on huge logs. But T. Bullock and R. Livingston seem to want something more "jungly", or at least they feel P. Scholander will. Pete, by the way, is due in soon (20th).

Out on the water the air was much hotter than on board and for the first time I mildly felt the heat. I cannot get over my surprise at how comfortable the climate is, especially when it is overcast.

I spent most of the day happily trying to set up my sound transmission gear, fiddling with oscilloscope dials and trying to damp resonant waves in my tank. I failed, and finally at about 10:30 PM tore it down and decided I must work in the river. So tomorrow I build a new gadget to hold an animal in the water. I'll also set up gear on the stern under cover.

After a grand steak dinner and a Dean Martin movie, I spent some time cogitating my experiment and looking at Ted Bullock's emerald tree boa and then to bed.

We are anchored perhaps 50 miles above Manaus, 250 yards offshore with the sweet heavy smells of the jungle wafting around us. It seems very hard to believe we are here somehow, surrounded by comforts such as air conditioning, water fountains, three excellent meals a day, hot and cold water, and labs filled with the most sophisticated gear.

March 19, 1967

Rio Negro at entrance of Rio Braueos, Brazil. We are now at or near the station where the permanent shore camp will be established. We hoisted anchor at dawn and steamed up the river between green walls of vegetation. The clothing of vines and foliage grows so dense along the river's edge that one can seldom see into the forest, except where it has been cut or cleared. The forest is a bewildering array of different types, sizes and forms of trees. Feathery palms are common, occasional rubber trees appear—podocarps, silk oaks, and many, many that I cannot even guess at. Vines are

everywhere and are unbelievably strong. It was all I could do to break one about $\frac{1}{4}$ in. through.

Several *boutu rosada* (*Inia*) flashed in the tea-colored water and I saw an occasional shy tuxuci. A good many birds flew along the banks as we passed. Little kingfishers, herons, egrets, terns (surprisingly), parrots, and several ospreys. Thatched houses lined the banks periodically, most were on stilts in ragged clearings and had a half-dozen little brown children peering out the front glassless window as we passed. May came down to the water as our big boat passed, only to watch our wake roll in against the bank and scurry for high ground. One young boy raced down to his dugout and snatched out a precious furred umbrella before the wave hit. He scrambled triumphantly up the bank. One family of mostly girls squealed with delight as we went by. Tall feathery manioc filled most clearings, though bananas were also common enough.

I pressed the carpenters into service and they built me a fine porpoise holding trough that I will suspend over the side when we get animals for the sound transmission tests. Tomorrow I will, at least, test the gear in the river.

At about 3 PM we came into a broad area of the river just above the entrance of the Rio Branco and dropped anchor off a bright white beach topped by a shack that seemed abandoned. Soon we were all ashore exploring. It was much like coming ashore in a new island full of unknown wonders. The house proved to be in pretty fair shape—tile roof, adzed hardwood floors and only a modicum of holes for the rain to enter. Of course, there were no windows; nobody seems to bother with them. We learned it belonged to the local tax collector and that local people thought we were tax collectors at first. Around the house were rubber trees, mangoes, cherimoyas, guavas, and behind a tree-filled swamp of tea-colored water. We walked down the beautiful shining beach and could see the marks of past receding water levels. At highest water it reached about 8 ft. below the house and left it on a 50-yard island. At this stage there was 50 yards or more of beach extending downslope to the water.

Surprisingly, several very large granite boulders rose up from the water's edge—some 10 ft. high. As we hiked down the strand we noted glass palms with needles protruding from both stems and leaves, brazil nut trees with 1 lb. fruit half ripe, great termite nests plastered high in the big trees, oropendulas, big oriole-like birds, a sandpiper, a creature like a surf bird with a striking black-and-white body and red legs. He was chased viciously by a peculiar purplish bird that looked like a cross between a purple martin and a hawk.

Right at our landing the inias came in. There were two or three and they came into the half-submerged bushes, blowing noisily and raising their snouts out of the water. One gray one jumped completely into the air. They seemed to be grubbing around in the muck and were moving very slowly. Finally, a lone tuxuci came in briefly. Unfortunately, before I could get my recording gear together, they were gone.

At the boat I put my gear into the skiff and piloted by Bob Piddington and M. Ruez of the Brazilian Navy, we started off to record. It was falling dusk and the river turned to black glass. Over the feathery outline of the trees the sky grew coral. Piddington took the whaler up a couple of absolutely still back waters where the reflections of trees fell in the water with perfect fidelity. It became almost impossible to see the shoreline. The smooth flight of the boat seemed to be in air. It was eerie and

beautiful. Bats began to dip in the midst of this airy curtain, making silver rings spread around them.

After supper I tied the skiff astern and listened to the underwater noises of the river. It was quiet except for some chirps and repetitive dull smashing sounds. I thought I could hear the faraway slow repetition rate cruising calls of porpoises, but could not be sure. One thing for sure, our boat can be heard. Auxiliary motors, clanging hatches, people stamping their feet.

After a bout with the tape recorder (successful), I'm off to bed.

March 20 1967

Up at dawn and off by myself with whaler to look for porpoises. It wasn't long till I came upon a school of *Sotalia* milling and diving about 50-100 yards offshore in a still backwater. Try as I did to creep upon them, I could not get closer than about 35 yards. They were clicking in low repetition rate trains of very intense little clicks. I recorded for a while and finally turned back to the ship. The school was composed of about six animals including some half-grown young. At its biggest the tuxuci is small, perhaps 5 ft., with a prominent snout and melon—lead gray and white. One jumped clear once, but for the most part they stayed submerged. When frightened they bunched together just as a good porpoise school should, and plunged off in unison.

On board I spent the day rigging the apparatus over the side for the transmission test—wow, what a lot of practical electronics I am learning! Then we spent some time analyzing the tuxuci pulses I recorded. They are very brief, 0.6 m/sec. or less, but my tape proved to be overloaded pretty badly, so I will have to record them again.

After dinner (wow, the quantity and quality of food in this ship is the best I have encountered—I'll gain 20 lbs. 'ere I'm home. Alan Berliner and I took a ride in Scwhartz's boat across the river to a backwater area where *Inia* was supposed to be common. We pulled up in front of a picturesque little village of thatched shacks on silts and Valdovino the harpooner left us in his dugout while we drifted and listened to underwater noises. In air we could hear frogs calling, but underwater, it was a madhouse. Frog calls of the sap cururu (*Leptodactylus* sp.) echoed back and forth; a vegetarian relative of the piranha croaked, things stroked balloons, creaks issued from the banks, and across it all came sporadic porpoise clicks. Then when the hydrophone, unbeknownst to us, began to bang against the hull, producing a dreadful row, it was too much. Valdovino threw his harpon and it bounced off of an *Inia*, and finally we packed up and went home.

Back at the *Alpha Helix* we found that the captain had not returned on the launch *Serendip* and is somewhere upstream, most likely broken down. On that anxious note I go to sleep.

March 21, 1967

Up this morning early. Captain Perez and I put my recording gear in the whaler and went upstream. As we cruised along, we stopped periodically and put the hydrophone in the water. In midstream we stopped to record some tuxuci clicks, but the animals were gone. Later on we approached a small island in midstream and saw the peculiar lump snouts of the boutu rosada poking up in the rip of the downstream end of the island. We pursued them at last into a tiny still cove on the upstream edge of the island. I guessed that there were six animals in all, some small ones and a couple of old

horses. All were bright pink with a fading of gray dorsally. The skiff was stopped and we drifted along silently in among them. I canned a magnificent recording from the encounter and happily turned back to the ship.

After breakfast I completed preparations for the transmission equipment and in the afternoon, I went ashore to watch Don Lindsley and Bob Livingstone try maze learning tests with a group of sloths. I helped them string up a horizontal framework of limbs inside the tax collector's shack, almost backing into a wasp nest in the bargain. Once it was strung the sloth was hung on the framework and asked to creep his way down the only route that would let him escape out the door. There were three or four blind alleys which he could creep that ended in mid-air. The first sloth on the schedule was Pedro, whom I called Jimmy Cagney, as his hair was parted in the middle and he looked for all the world like a pug-nosed Irishman, except that sloths are evident in having no guile. Even though Pedro had understood this same maze in Belem, he turned every wrong corner and climbed wires.

Sloths have a very thick, coarse reddish-gray and white hair. Males have a distinctive pattern on their mid-backs of short, yellowish-orange hair with a central longitudinal blue band. Females are undecorated. I suppose this helps sloths tell whose back they are climbing on. They are long limbed, lightly muscled animals that have a surprisingly tight grip as they hold their claws back against their long black palms.

The next sloth was Bernard Baruch and he was no better. Learning studies on sloths are difficult work for human experimenters. At one point I looked over and found data taker Livingstone snoozing at the helm, notebook crooked in limp fingers. It could happen to anyone.

I left the sloth scientists for a walk in the forest and was able to spot the big emerald green teiids that had been leaving tracks all over the beach. They were all back in the grassy areas of the forest and raced off by bipedal locomotion, I believe. I think I saw a tiny microteiid, too.

Back on board I made ready to go out porpoise hunting with Valdovino, one of Schwartz's boys, and Captain Perez, who has attached himself to my work. I find him a miserably bossy field companion who must give many orders. I have generally ignored him and on a couple of occasions told him "no", but I don't like to do this if I can avoid it. Time is short and his goodwill is important to the trip.

Anyway, with Valdovino's canoa in tow, we set off across the river to remansa (backwater), where porpoises are supposed to play all day and evening. We had treated Valdovino's little daughter, Maria, for malaria this morning and he was all cooperation. Maria is a beautiful little child of two with big brown eyes and long curling lashes. She is ill with intermittent fevers and damaged spleen, and also serious anemia. When all the strange white folks looked so serious, she looked up with wide eyes and burst into tears. Valdovino and wife and another girl and four children live in two canoas. One is a long, low, thatched affair in which they cook. He offered, but I did not accept, some noxious-looking boiled meat served on what looked like crushed dog biscuits. Valdovino is a supple barefoot man of 30-35 with scraggly, eroded, blackened teeth from decay, not betel, a thatch of unruly black hair and an engaging kindly face.

The river is wide and I had to husband our gas supply. Three quarters across we came upon a rapidly moving school of tuxucis who were out of range before we could get

our gear in the water. Down the coast to the remansa we went. Sure enough, there we found both a dozen or more boutu rosada and small schools of tuxuci.

We set Valdovino free and watched as he sliced the water delicately with his broad, spade-shaped paddle held in one hand with long wooden harpoon held in the other, resting on his shoulder. Silently he slid toward the milling boutu. One surfaced ahead of him, bright pink in the afternoon light. He stood up and threw his harpoon, away late and well behind the slow-moving boutu. He did not throw again all afternoon and soon indicated that it was hopeless. I recall thinking as I saw him throw, "Either he knows something I don't, or he cannot even hit his hat." And what fisherman on the River Amazon can't throw a harpoon?

Later I learned from Dr. Sawaya that he probably was superstitious about the boutu, thinking they bear the spirits of the dead relatives. At any rate, it is obvious that I can't rely on Valdovino for boutu.

As we drifted at the mouth of the remansa, a sight such as one sees at sea took place. A school of bait fish was being harried by a slender, gray-and-white tern-like bird from above and from below by a 1-2 ft. silvery fish called apapa. Around the periphery of the melee cruised the porpoises of both species.

Back on board we worked on experiments and I finally gave a seminar on the sperm whale and finally to bed.

March 22, 1967

Up this morning at 5:05 AM, to go with Sam Crouse to hunt for porpoises. It was pitch black and we finally decided against going because Sam had to begin work in the galley at 6:30. So back to sleep and I didn't make it out again till 9. I fiddled with gear until noon and then cruised up to the little island and was put ashore. My plan was to climb a great *Bursera* tree that overhangs the water about 40 ft., and to wait until a boutu swims by and blast him with the harpoon gun. With a convenient machete I hacked a trail through the lianas and trees to the base of the *Bursera*. By sawing some lianas from it, I made a set of ropes to help me climb up into it. Then I took the harpoon line and shock cord up and finally out on an overhanging limb where I tied it down. Returning for the harpoon gun, I took that up too, and finally secured it well and flaked the lines over a nearby branch. Once all was in order, I clambered back up past the mossy place where the ants lived to my liana pathway along the trail to the landing spot. By this time I was absolutely saturated with sweat. The humidity and still air combine to reduce one to the siesta schedule, which no right thinking Anglo Saxon can take without a struggle.

I had no more than settled down to listen through the hydrophone than I saw a pair of *Inia* cruising into my little bay through some partly submerged vegetation at the end. I listened for a few moments and then raced for the tree. I had negotiated most of the tree and had one hand on the harpoon gun when they surfaced directly beneath me and were gone in the deep amber water. They surfaced again near the outer rocks of the bay and then I could hear their snorting breaths out in the river. No other chance came today.

I watched, listened and waited, and perhaps a dozen porpoises, both *Inia* and *Sotalia*, went by, but none came in the cove. I read, wrote notes, washed my shirt, and listened to the jungle. Doves have the most prominent voices though some unidentified

avian screaming was louder. My terns of yesterday flew over, gray wings with diagonal white on dorsal body and inner primaries.

Epiphytes are common, bromeliads, orchids, and a variety of unidentified flowering plants. Begoniaceous plants are common as trees with large showy flowers.

About 5 a crewman picked me up (too early, I thought) and we returned to the *Alpha Helix* for a magnificent roast beef dinner with Yorkshire pudding.

After dinner B. J. O'Brien, a big Aussie from Cairns, and I cruised out to test out a harpoon he had made. We drifted quietly among puffing tuxucis and boutus, but to no avail since they never came near.

Tomorrow I try the tree again. This time early in the morning till noon.

March 23, 1967

Up at 6 AM and off to the cove. I cruised into the little pebbly embayment where I moored the boat to a tree and set up recording gear. One odd fish (?) was banging away and making such a racket that I wasn't at all sure we could hear a porpoise recorded anyway near him. But later on he subsided enough so that I could work. I no more than had my gear in the water than a boutu rosada broke the surface near the cove entrance. I dropped everything and raced up through the grassy patch, back of the landing, through dense jungle where I had hacked my trail, scaled the tree with help of the liana hand-rails, and finally out onto my perch. Nothing came up, so after many minutes I carefully stirred myself on my somewhat precarious perch, leaned the harpoon gun against a tree limb, clambered over the branches being careful for the slick spots, avoiding the ants and thorny little vines, and made my way back down to the beach. It was hot and still and my clothes were wringing wet from the exertion. As I sat listening in the skiff, it began to rain, so there was a flurry of activity while I stowed my precious tape recorder and other gear, and then sat hunched under my raincoat watching the forest and the river in the rain.

A slow, chugging sound began to increase from in back of the island downstream, and before long an archaic old paddlewheel steamer slid into view. She was all of 100 ft. long, laden with barrels and boxes, her tall stack fitfully belching smoke from the wood-fueled boiler (stacks of cut wood stood on deck to feed it). She cut diagonally across the Negro to the far bank and curved up the river almost hidden to the eye against the green wall of the forest.

Before long the rain subsided and once again I saw a boutu enter the far end of the backwater. I snapped on the tape recorder hurriedly and ran for the tree. Once again I sat and saw nothing surface.

Finally, near noon I hopped into the skiff and returned toward the boat, testing the walkie talkie enroute. It would pick up the ship only when in direct line of sight, and even then only when less than half a mile or so away.

I asked and received permission to go on down toward the remansa to hunt for boutu. This took me into one of the paranas or channels away from the main river; this one 450 yards across or so, more overhang with tall trees and quieter than the river itself. A few wary tuxucis were all that greeted me until I emerged once again at the main river about one mile upstream from the remansa. There I encountered a group of about six boutu rosada, all small and all gray in color. There were two very small babies in the group, the smallest about three ft. or a little less in length. They were puttering along the edge of a hedge of semisubmerged vegetation and occasionally even went past way into

the branches. The babies often swam many yards away from the larger animals, but when I frightened an animal, they rushed close to the side of an adult. The largest animal in the group might have been six ft. long.

I am impressed that the gray color and pink color of *Inia* does not represent two species at all, but simply two color phases based upon age. I have seen several animals that were intermediate. Usually the beak, the anterior melon and the posterior tip of the dorsal fin. The melon is often mottled gray and pink in these animals. All the more or less uniformly pink animals I have seen were large. The color is enhanced by the tea-colored water.

All attempts to catch one of these animals failed. They dive for too long, 2-3 minutes, and follow no predictable path underwater, and are exquisitely sensitive to the presence of a boat, even a quietly drifting one.

At the remansa entrance I lowered my hydrophone over the side and sat, earphones on, listening to the voices of the Amazon—toads, fish, and porpoises. The boat drifted along in the current just at dusk, past a village on the bank. One man, thinking my motor had broken, rowed out in his canoa. I explained as best I could and finally called him over and clapped the earphones on him. He broke into a broad grin, “Ah, sap cururu,” he said laughing—the toad calls. He explained that the insistent rapping noise was the call of the apapa. I didn’t learn what the apapa was. Then to prove my motor worked, which he insisted I do, I revved it up and soon was headed back to the ship, skimming at full speed over the glassy water. This river has different faces several times a day. If the wind picks up against the current, it can get very choppy, particularly where two currents come together.

Back on board we had our usual fine meal. Joe the Guamanian cook, outdoes himself each night with some new delight.

Then Ted Bullock, who couldn’t have been nicer to me in many ways, asked if I wanted to try hammock sleeping over in the tax collector’s house. There our two large-size hammocks strung up, covered with a fine cheesecloth bug deflector. I was tired and so was Ted (who had been up all night doing an experiment). “Whoever goes to sleep first will whistle,” he said, and promptly drifted off with no sound but heavy breathing. For my part I had to experiment with the hammock to find out how to cope with it. My hammock was for a couple, but I couldn’t see how. I found that by lying diagonally one could be almost flat. Slight movements allowed one to support this or that part and by a delicate equilibrium one could support most of one’s corpus, and being careful all the while not to press against the mosquito bar and thus allow easy access to your red corpuscles. Insects are few though and mosquitoes at a minimum. In fact some soil factor makes the whole Rio Negro region impoverished as jungles go, and it is remarkably free of diseases—malaria is sparse, shistosomiasis absent, filariasis absent, and so on.

Other than the piercing cries of the captive sloths, nothing disturbed my rest.

March 24, 1967

This morning Peter Hartline and I went together to my island. Peter is a young neurophysiologist who has been teaching me how to run various instruments. He is an exceptionally bright and personable young man who already can handle his field with considerable skill, and who has the best command of electronics of anyone aboard.

We came into the cove via the upstream approach, but no boutu were there to be disturbed anyway. I set Pete up manning the listening post while I scaled the tree. More or less continuously (with time out twice while I stood and climbed up and down a few branches to get the kinks out), I sat for 3 hours on my branch, harpoon gun within reach, and lines and shock cord flaked over another nearby branch. No boutus.

Finally, I commented to Pete that we had given it the old college try. Twenty minutes more, says I. Twenty minutes later and still no boutu, so I called Pete over in the boat after test firing the harpoon gun and lowered all my gear to him. The gun, by the way, goes off with a helluva bang and kicks like a horse. This accomplished, we went back to pick up the listening gear and were just about to leave when, sure enough, exactly according to the libretto, into the cove came a boutu, big as life. I thrashed around frantically to get the harpoon and lines organized and decided to rush off in the drifting skiff in hopes of getting a shot. Finally, I decided that this might frighten him and so came ashore again, only then to find that I had tied down the wrong line. The harpoon line was unsecured and would have gone over the side like a shot.

Next I set up a post on the high-cut bank at the base of my *Bursera* tree. The boutu came in and surfaced within easy shot of the limb station, but too far from me on the bank. Finally he left the cove and was gone.

Back at the ship we had lunch and I made preparations for another hunt. This time B. O'Brien, the shore camp cook, went with me. He is a big burly Aussie from Cairns. He had fashioned an aboriginal prong spear out of nails and tape which he wanted to try. It was built like this [drawing]. These sorts of spears are reported to hold dugongs weighing as much as 2,000 lbs. Anyway, pushing off from the ship we made our way across the river and quickly encountered several boutu feeding along the opposite bank. Try as we did we were not fast enough to catch one. They surface abruptly from the opaque water and seldom in range. Finally we headed up the remansa. Glassy calm water floods into the forest on both sides leaving an overhanging mass of vines, limbs and tall trees as the borders. A heavy sweetish smell of the jungle pervaded the air. Ahead of us, bright rings spread where boutu surfaced and submerged again after their brief breath. Occasionally the skittish tuxuci surfaced and plunged away.

We drifted and watched. Rapidly moving trails of bubbles, like those from a diver's hose, cut around us and we finally concluded that they came from the boutu rooting in the muddy bottom 25-30 ft. below us. But each time the bubble trails came near, they cut away again and stopped. A few moments later a boutu surfaced at some unexpected point, just out of range. They blow explosively and rise to the surface with the tip of their long snout first, then the bulbous forehead and blowhole. Their eye usually stays just below water. Dusk came and we turned reluctantly for the ship, gliding along into a magnificent sunset, tiers of clouds lighted up in color and finally the sky itself became rosy and faded to amber, and finally the lighted blue of early night.

After dinner Peter Hartline helped me to use a scope camera to photograph boutu clicks. Mastery of an instrument such as this provides a very pleasant feeling. I am beginning to become more a master of my own house in which I can interpret and study my data without having to rely upon others so completely. I must extend this more and more.

March 25, 1967

Up this morning early and with Bob Livingstone cruised off with a ship's rifle (British 303) to see if we could shoot a boutu. We headed for the remansa as I wanted Bob to see it. He is a tall rawboned guy who can charm you out of your shoes. He constantly seeks to thank and compliment people for things they do. He is also a tireless, careful worker of a very considerable note in brain studies. He is a sailor and thus good company for a cruise of this sort.

Knowing my own meager skill as a rifle shot, I gave Bob the gun and steered him in among the boutus. Even to obtain a rifle shot proved very difficult. There just isn't time to swing around, aim and fire as they surface, blow and dive under again.

Finally Bob did squeeze off a shot that missed, the bullet skipping over the water in a ricochet. After a time we entered the remansa (or iguape), passing the thatched houses and on up into uninhabited jungle. At the junction of two channels, I dropped anchor and we waited while I listened. The boutus were all clicking away at a relatively slow rate. When they were somewhat over 100 yards away the clicks dropped to such low levels that I could no longer hear them. Once again Bob fired a shot that seemed to hit a boutu and shock it sideways in the black water, though we couldn't be sure. The clicking became a little more insistent, it seemed, but that was all. No cries or whistles. The boutus moved away from us a little, but seemed very calm about the affair. Soon we hauled in the little anchor and continued upstream, soon coming upon a group of perhaps 15 tuxucis. They moved very warily, as usual. We circled and chased them at high speed and could easily outrun them, but like the boutu we could never tell where they would come up, and even though they did so in a typical delphinid school in unison, I was never fast enough to shoot.

The channel led on into the jungle into a broad lake dotted with islands of drowned vegetation whose tops just protruded above the water. Much of the forest is drowned in this way at high water which may be 30-50 ft. higher than the lowest stage. How plants survive and grow tall enough to reach above the water is a mystery to me. Certainly it becomes unpenetrable when the water floods out and one meets tangles of foliage, vines, and limbs. Some trees are simply encrusted with epiphytes, some dangling long red flower stalks, others sprouting showy white blossoms. Giant phyllodendrons climb many trees, and pod-bearers are everywhere—yellow bean-like pods, ones curved like pears, and the heavy flat cups of Brazil nuts.

As we sat quietly drifting, I was impressed again at the noises in the jungle. It seems that someone is always dropping something. Things go "plop" at the water's edge, cicadas hum in certain trees and the chirring call of howler monkeys could be heard. A woodpecker whacks out a deep resonant staccato that echoes through the forest. Boutus blow explosively.

In the lake we frightened several interesting birds including a pair of macaws with their metallic blue backs and burnt umber yellow undersides. Gas was getting a little low, so we turned and headed back for the boat, somewhat chastened on the problem of obtaining a boutu, but nonetheless pleased for our trip down the water jungle waterway. Even though I had rather little hope by this time, I set out again after lunch to try again, this time with the mess boy, Sam Crouse, and Alan Berlind, a student from Harvard working on neurosecretion. I came close to firing at a tiny little tuxuci that couldn't have been more than 2 ½ ft. long but he proved to be elusive. The sun had come out in full mid-day force so we all covered up as best we could. I wrapped a towel around my

exposed dome and it helped. Soon, however, we headed back to the boat as Sam had to work on dinner starting at 3:30. He is a nice young fellow who has an MA in biology and wants to go on. This was his way of going on the expedition but he has rather little free time from his kitchen duties to look around.

Just before dinner, a big old boutu surfaced near the *Alpha Helix*, so a group of us jumped in a skiff to see if we could get a shot. Finally, I did fire a desperation shot that hit low and caromed over his back.

Back on board, the evening was spent using the scope camera on boutu clicks and in developing nearly 300 ft. of film I took. I finished by about 2 AM and hit the sack, exhausted. The recordings I have made are ample reward, even though I did not obtain animals for my transmission tests. They are the first from the Amazon and are of excellent quality that will allow a thorough analysis of the signals of the two species.

March 26, 1967

Manaus

I packed, disassembled and stored, said goodbyes, and about 1 PM went ashore to climb in the float plane with Diego, the pilot. He is a rough and ready bush pilot, who had been in photoreconnaissance in the Second World War and in Korea, who has spotted for tuna boats, worked the Andes for geologists, and who was one of the first of our craft in the air out of Hickam Field on Oahu after the Pearl Harbor attack. He neither drinks nor smokes, takes no guff from anyone, and flies his plane like the professional he is. As we boarded, just for spite an old boutu surfaced within 20 yards of the plane, puffed a few times, and was off, and so were we.

The flight to Manaus was interesting. Away from the river there is almost nothing except trees and water. Where the water does not flood the forest is untouched for hundreds of miles in every direction. The Rio Negro from the air is black as obsidian. One can see where its meanderings have left families of oxbow channels in the forest. Usually the trees there are smaller and of a more uniform kind than the untouched forest.

We spent the night at the Amazonas Hotel, a nice new hotel with the calcimine paint peeling off the ceiling and the john not flushing. We walked around town and I soon learned that Diego has spotted every pretty girl in town and had done his best to strike up friendships in every case. He knew which mamas shouted at him and which ones he could approach by playing with the little children.

After our promenade, we had dinner in the hotel restaurant. I had arapaima filet—one of the largest freshwater fish in the world. It was good but overcooked. The arapaima, or pirarucu, is a primitive osteoglossid fish living only in the Amazon Basin (Orinoco?). I saw it everywhere in the markets.

We had a chance to see Manaus a bit more than before. It is, indeed, filled with faded elegance. Most houses have tiled roofs that are mottled with blackish moss from the rains. Buildings from the golden era around the turn of the century show ornate facades, intricate grill work, and mosaics here and there. The bandstand and statuary are strictly out of Victorian England. We looked more closely at the opera house where Caruso and Galli-Curci sang. It has a great Port Cochere there for the arrival of Victorian carriages and is reportedly elegant inside. All along the streets young girls stood just outside the iron gates talking with their boyfriends while inside the open door sat the

duena keeping a watchful eye on the proceedings. Many walls are spiked or covered with broken bottles set in cement.

A few elegant houses built in the aseptic modern latin fashion had been built cheek by jowl with the run-down houses of yesterday. Graceful spiral staircases, elegant tilework and stained glass windows were typical.

Back at the hotel I quickly went to sleep awaiting my 5 o'clock call—after bashing a few eager mosquitoes.

March 27, 1967

Up at 5 AM and after a complementary breakfast (papaya, some fine tropical conserve, coffee, and toast), on to the airport. First, I retrieved my blowgun off the float plane where we had tied it, then to the airline desk. After due complications with officials, I got on board a fine old DC3 and we took off (at about 7 AM) for Leticia and points in between.

I had utterly no idea of the vastness of the forest until this flight which took me across the entire upper Amazon basin. It is immense and almost unbroken by human habitation—a carpet of tree tops, mostly dark green but with a scattering of white limbed species, or a spreading tree with light apple-green foliage.

Flowering trees are scattered through it everywhere and feathery palms thrust up through the canopy with much regularity. The scattered nature of each species in the forest is very evident when one looks closely—as if some ecologic force keeps spacing in existence—perhaps some ancient plant inhibitor evolutionary warfare. Here and there along rivers which wind tortuously through the forest, thatched houses show up surrounded by a little clearing and a manioc patch.

We landed at Tefe, a little town on the Solimoes (the upper Amazon), where a nun among our passengers was greeted with shouts of joy from a large group of young girls who had assembled at the dirt field to greet her. She was spirited off by jeep with six giggling girls clinging to the bumper. Gas was pumped into the plane from drums by hand pump through a big funnel filter. Soon we were bumping along the field and back in the air again. The forest became even less inhabited—an unbroken stretch as far as I could see in either direction. Only a winding river here and there broke the monotony. Finally, we sat down on the muddy field at the little village of Carauri on the Turua River, south of the Solimoes. The thatched airport building and stacks of gas drums made up the physical scene. The town had turned out to greet the plane which arrives weekly and is their major contact with the outside world. I saw a European fellow ride up on a bicycle and soon found that he was a Dutchman, a father in a Catholic mission here and had been in the village for 19 years. He told me it had taken six days by boat from the Solimoes when he first came and that he arrived in the middle of a typhus epidemic. Nine years ago the plane field was built (he wasn't sure, but he thinks with foreign aid money from USA). His town is terribly poor and his mission and its one doctor serve an area twice that of the Netherlands—20,000 people in the forest. The village itself is about 1,500 in population, a tiny mote in the sea of green. He told me the soil was not poor and that he had planted one hectare of rice this year and had harvested about 2,000 kilos from it. Now, he wanted to try soya beans but couldn't get them from his headquarters in the Netherlands. I gave him my address and will try to help him when he writes.

Up again over the green sea. The forest looks denser and taller and what houses we see are largely built on water on stilts. At one point, we descended under heavy clouds and over a forest that was about half fan palms—about the only unmixed forest I have seen. In places the forest streams. Vapor rises in hundreds of columns like smoke across the forest. I cannot see what causes this even though we flew directly over a few in landing. At Labaturga, on the Solimoes, a short distance from Leticia, Columbia, it seems to be a military camp judging from the number of sergeants that got off.

The plane swooped up and as quickly landed at Leticia, Columbia, on, believe it or not, a paved strip. I ambled off the plane and was met by the Booth Line Representative and saw a gaunt Greek-looking gent in a “Tarpon Zoo” sweatshirt whom I judged to be the animal collector, Mike Tsalickis. Indeed it was and soon the Booth Line man had surrendered me to Mike. Quite a surrender it proved to be. I was whisked through customs and into Mike’s Chevy carry-all for a bouncy ride into Leticia. Leticia sports about 5,000 people and Mike knows each one individually including talents and foibles. Mike, I found, is more than just an animal dealer. He is an American consul and used to schedule all four airlines in and out, runs a hotel, and is building a new one, is constructing a monkey colony on a 1,000-acre island he owns, exports indian artifacts, has supplied the hospital with all its furnishings via the U.S. Navy, and a whole lot more. It took ten minutes to be put up at his nice little hotel (cottage). We toured his animal-holding facilities which are quite sizeable and then I (oops, Leticia’s lights quit—the Swedish power plant bought so I am told, because the Governor married a Swedish girl) went into the dining room for lunch. Then began an amazing tour of official life in Leticia. Mike had to settle some affairs for a man named Deakin. Deakin, it turns out, runs a nudist camp north of Miami and comes to Leticia to get servant girls. Whether they too become nudists I don’t know. Mike was helping him negotiate for the 17-year-old daughter of a local family. The girl, named Maria, was a shy, pretty, thin-faced girl quivering with excitement over what was happening to her. I hope she isn’t disillusioned by the experience. Papers had to be filled out, the Governor’s signature was needed. She had to have a yellow-fever shot. I need a visa, and why Booth Line in Manaus didn’t take care of this I don’t understand. Anyway, they didn’t so we had to tend to this too. Then, I had to get a refund on an overweight baggage allowance. We hopped in the car, picked up Maria, dickered with the family for a little three-year-old girl, were turned down because she had a twin who would be lonesome, shot over to the Policia about my visa. It needed a two-peso tax stamp. We went to Fiscal and bought two—one for Maria and one for me. I needed two pictures and so Mike took me to the local photographer who was found under a tree in the Plaza. The picture he took registers my amazement at his methods. His shutter was full of long black-and-gray mold, so he sat me down while two people held a black cloth behind me, lifted the lens cap off his 2.8 Schneider lens and quickly replaced it 1/25 second later. Then, he removed and developed the film all in the bag at the back of the camera. We left to take Maria to the Governor, and met a Baptist missionary, the Peruvian Counsul, and the Brazilian Consul on the way, plus six people of lesser stature. Then we went to Aduana to try to get a release for Mike’s latest shipment of canned goods (he is a wholesale dealer). They weren’t quite released but in a few minutes they would be. We whipped over to Cruzero do Sul and got my refund of piles and piles of Cruzeros—156,000 to be exact.

Then, back to the photographer who was thrashing my prints around in a bucket. (Where did he get prints? I still don't know.) Five pesos there (17 p/1\$) and off we went. Aduana released the canned goods and it started to rain. Never mind, back to the animal farm for help. Me and five others to the customs warehouse where 5,000 pesos worth of food was stacked. We slipped and slid down the ramp to the truck with raisins, canned peaches, whole canned chickens, chicken and rice soup, pears, tomato sauce, and on and on. Three loads later, with my shirt and pants soaked with a combination of sweat and rain, we were done. Then to the Policia with my pictures and my visa was done. On to the hospital with Maria for yellow-fever shots.

They needed ten people before they would open a vial of serum so Mike collared his driver, his driver's daughter, tried to collar me, and three nurses. Finally enough people came in and the shots were duly given. Mike took me proudly through the hospital (40 beds) and well he might be proud too. It is clean and quite nicely appointed.

Then, back to my room to clean up and go to dinner. Amongst other things they served me fried yucca root and it was very much like potatoes, a little more fillous[?] and a tiny bit sweet, but very good.

Later, while writing these notes, three girls from around the corner knocked. Mike sent them to check on the state of the water in my bathroom (there isn't any till morning) but their tone and looks told me that their concern wasn't really the state of my water supply. I thanked them, said buenos noches, and they turned away into the night with their duty done. Good old Mike thinks of everything. I don't suppose it's in a consular agent's creed to be so thoughtful but then I don't really know.

Oh yes, a couple of other notes. Deakin I find is writing a book on nudism among South American natives. He has found his favorite tribe—a group living about 500 miles south of Manaus who are both perfectly hairless (the value of this escapes me) and perfectly nude. Then, he proceeded to describe these perfect creatures further—they were, it seems, killing themselves off. Any malformed baby is killed he said as if this explains their decline from 5,000 to 500. Deakin is a freckled, puffy-faced nervous type who exudes unreliability to me.

Mike on the other hand, exudes tremendous energy, charisma, guile, and yes, even a rake off now and then, but on balance is effective, useful, and works in the best interest of our country. He told me about the puberty rites of the local tribes for girls. With the first menstruation, they are locked in a cage and kept out of sight of all males and only released at night for a time under careful guard. Then the family saves to give a party—smoked monkey and other delicacies and finally, a party is given in which everyone including the girl drinks to stupefaction. Then, the tribe elders pull all the girl's hair out and the ceremony is over and she is an adult.

March 28, 1967

After a flurry of packing pots and other goodies, I climbed aboard a Saterra Airline's plane with a dozen other passengers and great bales and bags of freight where the seats had been folded out of the way. For once, there was a good place to stow my blowgun and newly acquired Ticuna indian arrows. The jungle goes on and on. I am staggered by its immensity. After some hours on the plane, we still are over jungle with muddy oxbow rivers here and there. Finally, the jungle began to break here and there with a high ground savannah making its appearance. The jungle then became restricted

to watercourses. With the savannah came roads and I saw two or three cars moving along like bugs. The rivers up this far were at low water. Big sand bars showed tan at every river bend.

We flew through a couple of clouds that tossed us around and flapped our wings ominously (to me anyway—I never like my airplane wings to flap).

Finally, after flying blind, we burst through the clouds to see the Andes all around us, the steep slopes either clothed in dense rainforest or apparently bare. The tiniest usable plot of land of less than 30 degrees was walled with rock with . . .

(Note: The plane landed at Bogota where I stayed overnight, came down with Montezuma's revenge, staggered through customs, got on board a Varig flight to Miami, slept through most of it, and barely made it through customs in Miami with the blowgun and other paraphernalia, got on a flight to L.A. and landed feeling much better.—KSN, November 3, 1971)

September 2, 1971

Northwestern Hawaiian Island Trip

Midway Island

This trip is being taken as a routine survey by the U.S. Bureau of Sport Fisheries and Wildlife, under Gene Kridler, the Wildlife Administrator for the Hawaiian Island National Wildlife Refuge. I was invited to go along as an observer and to take a look at the marine mammals. Eric Laysan Schlemmer is along. He was born on Laysan Island in 1903 and hasn't been back since 1923. He will place crosses on the graves of a brother and a young Japanese girl. He was on the island off and on from 1903 to 1915, and then returned with the Tanager Expedition. John Sincock, the ornithologist of the Bureau who spends much of his time studying the native Hawaiian birds on Kauai, and Erwin Bauer, an adventure and wildlife writer from Columbus, Ohio, make up the rest of the party. I drove to Gene's house at 4 AM, we loaded gear on his station wagon, and picked up the others along the way to the military field (Hickham Field). We had a nice 2 ½ hr. flight in a jet plane of Saturn Airways to the Midway field. Along the way the plane passed over Necker Island, a rugged little curved necklace of rocky promontories that surrounds a little bight of water called Shark Bay like an old Hawaiian fishhook. As we flew over I read from K. Emory's paper on the archaeology of the island. It is covered with marae or stone platforms which have upright slabs of stone along the perimeter. Stone idols of a very characteristic type and stone bowls, one of which was found by Queen Liliokulani, were also taken. Emory hypothesizes that these temples were older than most remains on the main islands. I suppose Necker is ½ to ¾ mile long and perhaps 300-400 ft. wide (actually it's quite a lot wider than this).

I sat with Eric. He is a spare, gray-haired gentleman of 68 with a twinkle in his eye and dozens of stories about Laysan. He told of going there in a sailboat named the *Helena* and encountering a storm that sprung the deck house and caused water to flood in. The pump wasn't working because a bottle had fallen into it and broken. He fished the pieces of glass out and looked at the leather flap valve, finding it badly cut. His father instructed him to cut leather from a shoe. Eric wanted to know if they should turn for the safety of Kauai but father remained firm that they were going to Laysan and that was that. With the pump fixed they pumped constantly, the storm finally abating and they

made it into the channel of the island. The boat was moored to an underwater shot of chain stretched between two large anchors. Somehow it broke free and when they discovered it the vessel was far at sea, drifting away. Eric's father gave the son a box of matches and said: "Do the best you can if I can't get back."

Then he set off in the skiff to try to catch the drifting craft before their entire contact with the outside world was lost. He made it back. Eric was one of 17 children borne by his mother and the family was operating the guano industry on the island. They hauled the guano on a railroad car pulled by mules. Eric, in later years became the maintenance superintendent of the Hawaiian Electric Company in Honolulu.

His trip on the Tanager Expedition was to help with the local terrain and to advise on landings, etc. Alexander Wetmore was along as were other well-known scientists, and Eric acted as his personal assistant. The trip took him to the northwest Hawaiian Islands and then to Wake and Johnston Island.

Birds were everywhere. Especially abundant is the ethereal fairy tern. This delicate little bird is pure white except for black legs, beak, and eyes. It is flying in pairs and hundreds rest up in the ironwood trees. These little birds gleam like shining alabaster jewels as the sun shines through their feathers or glints off their backs and heads. They are bold little birds and once in a while we would rouse the ire of a pair that had been wheeling together high in the blue sky. They descended on us and swooped and fluttered about our heads, hovering with a torrent of chirring tern cusswords, often inches from our faces. I tried in vain to photograph this but always had the wrong lens or one that was out of focus. To see them swooping against the dark grayish green backdrop of the casuarinas lit by the sun is something of constant beauty. Erwin and I manfully tried to catch it for hours on film. He may have succeeded. These little terns lay eggs on limbs or in crotches of trees, the babies hatch out, sans nest and simply perch immobile in these precarious places as they grow. I crept up on a mother and young on the dead limb of a *Casuarina*, but I needn't have bothered. I finally came within inches. I wanted the mother to raise her pretty white wings and so I waved my hand a foot or so from her. Instead her fuzzy little chick raised his downy wings in anticipated flight, but he was two or three weeks too early.

Noddy and Sooty terns are common, especially the former who flit amongst the trees or gather on the wires emitting their raspy, almost crowlike croaks. CPO Cunningham took us to the nests of several red-tailed tropic birds. Deep in the tangled glossy green leaves of the naupaka jungle one could hear the threatening squawks of these birds when one blundered near, crashing through the brush. The pretty black and white checkered babies, as big as momma, sat immobile on the sand looking apprehensively at one. Sometimes they ruffled up their feathers, spreading and tilting their wings toward the intruder and pointing their sharp black beaks at one. Fearsome enough, I suppose, but they couldn't hold the pose for long, but deflated back to normal size again. Parent birds, glossy white with a long thin red wire of a tail and with a Chinese red, almost lacquered bill, sometimes sat immobile too, allowing me to photograph them from inches away. By poking my camera in first I could protect myself from possible jabs of their powerful appearing beaks. Ken Balcomb says they return to the same nesting spot year after year. He has been banding a lot of them.

We flew over Pearl and Hermes Reef, a turquoise and white jewel set in the midst of the azure deep sea. It is a true atoll, one of two in any U.S. state. The other is French Frigate Shoals. That is to say it has a circlet of reef border that forms small islands at various places with a large central lagoon connecting to the open sea by “passes or channels”. The fringing reef is dissected into channels and coral fins, the channels being deep clear blue and the coral brown and tan. In the lagoon one could see vast areas of sandy reef flat, reflecting nearly white through the crystal water. From place to place the water would deepen into green or greenish blue. One could see domes and heads of coral rising from the depths.

I slept as we passed Laysan but Eric was happy to see it shining out toward the horizon, the sun glinting off the central salt lagoon. Not long after we circled Midway, a two-square-mile low island, surrounded on the north by a broad lagoon. There are two islands. ? Island where most of the 2,100 people live and where the airfield is located, and Eastern Island which has only a few people operating some kind of station—loran, I think. The field is a right-angle affair and runs along two entire sides of the main island. It is clearly capable of handling the largest aircraft. The island is rather heavily vegetated mostly with *Casuarina* trees, though there is much naupaka (*Scaevola*) along the shore dunes, and kamani trees are scattered through the forest. They had had quite a lot of rain recently and the soil was grassy and green nearly everywhere. It is a Navy base, operating a loran station, a radio center, sonar and listening and some secret activities, in addition to the airfield. The channel between the two islands has been dredged and seems capable of handling rather large ships. Our craft, the Coast Guard ship *Buttonwood*, was in awaiting our boarding on the 4th.

We were met by Navy authorities who quickly checked us through and took us to the BOQ. We are in spare quarters, but adequate. I called Ken Balcomb, who is Operations Officer on some secret project—acoustic I believe—and before long he came over and we made arrangements for dinner at his house nearby. In the meantime Chief Petty Officer John Cuninghame took us on a tour of the island. We passed the waterworks, which uses the airfield as an catchment basin for rainwater. They also use the brackish lens water, mostly for sanitary purposes. The CPO took us on around to the seaward edge of the runway where we invaded the naupaka thicket

Midway is a little tranquil paradise, and like all paradises, it takes some getting used to. The streets are shady winding lanes, bordered by tall casuarinas, with birds swooping and going about their business everywhere. There are few cars and most everyone rides bicycles. They all know each other and a stranger is spotted immediately, being the object of much curiosity—especially I am told, non-military types. These folks are all doing something interesting or they wouldn't be here. The usual Navy arrangements pertain—CPO clubs, Officers' mess, BOQ's, nice but spare married officer housing, the senior officers with metal signs hanging from pipe posts out in their front lawn—names stencilled on, indicating the impermanence of any military assignment. There are lovely swimming beaches and one can rent a sunfish for 25 cents an hour. The girls are all tanned within an inch of their lives. Everyone's wife has a job, in the PX, the company store, in the Post Office, or whatnot.

Julie Balcomb, Ken's wife, loved the place but said she had missed some of the amenities at first but then everyone was so friendly and had parties going all the time that soon she didn't care and shortly after that she didn't want to leave.

We looked at our future home—the Coast Guard ship *Buttonwood*, a 185-ft. buoy tender—well deck amidships, bridge aft, 11 knots wide open, round hull adapted to light ice breaking (protruberances under water get caught in the ice and if one gets frozen the ship will not be squeezed free like a watermelon seed between the fingers). She was anchored in the little enclosed harbor of Midway waiting our arrival on the morning of the 4th. After a nice dinner at the local palace of culture—the Steak House, we headed for Ken's house and thence back to the BOQ to sleep.

September 3, 1971

I met John Sincock and Eric in the room last night and they were both sipping straight gin. I sipped a little too and then crawled in the sack for a nice snooze. Today was spent getting supplies at the PX—very cheap—got in a little more exploring and had a very interesting morning at Kure Island. We boarded a big Navy helicopter and took off for Kure, with us strapped in amidst piles of supplies for the Loran station there. Gene and John sat in the door to view the monk seals and to try for a count.

The chopper lifted us across the 65 miles of choppy blue water to this little atoll. There are two motes of land, the main one, Green Island, of about 10 acres or so, mostly taken up by the Loran tower and associated buildings plus a little strip. We skirted the other—a sand spit on which we saw about 20 monk seals sunning themselves.

The chopper returned and settled down in front of the main building. There we met the CO—a Lt. J. G., Joel Greenberg—nice but quiet—all the other islanders were notably absent, almost as if they shunned company. We, however, ignored this and went about our business of making a survey of the seals. I talked to Lt. Greenberg and he told me of seeing a school of 20-30 porpoises enter the lagoon through a channel on the far side. He described them spinning without prompting from me, include saying that they spun 4-5 times on their longitudinal axis. He said he had not seen them before. He had been on the island since April and said he walked the beaches every day.

I walked the strand to the north, along a shining coral beach backed by dense naupaka. At many places I could see the shallow troughs where monk seals had hauled up on the beach and into the naupaka. In one such trail I found the culprit—an adult female lying on her back snoozing in the partial shade. Her blubber jiggled as she breathed and rolled loosely about her. She fidgeted with one flipper scratching desultorily. She uttered a very low frequency pulse moan of low intensity as she slept, no doubt dreaming of some monkish exploit.

On down the beach I went, with noddy terns rising in flocks ahead of me and swooping about my head. Frigate birds flapped into the air from the naupaka and croaked in unhappiness as I came too near for comfort. Out on the extreme sand spit I came across three more seals—two adults in the water and one pup (tagged with two stainless flipper tags numbered, I think, 167). One of the adults had a grievous wound in its chest—a lunate cut clear through the blubber, perhaps by a shark with a gape of a foot or so. It was so fresh the animal clouded the water with blood as he rolled away, actually turning over and over on his longitudinal axis as he moved into deeper water.

I pressed hard to get back in time, plunging through the naupaka and disrupting about 20 nesting sooty terns in the process. They objected but I made it in time. On the way back we set down on the sand spit and looked for tags among the seals.

On the way back we circled Midway lagoon looking for a porpoise school that had been seen the last few days there. It was reported to enter by Wells Channel on the north shore and leave through the dredged channel on the south. The school was supposed to have 30-40 animals and to come in the late morning and to leave in mid afternoon. They were reported to go into quite shallow water. One person reported spinning. We found them over against the drop-off from the shallow reef flat north of Eastern Island. They skirted right along the shallows and I estimated 35 animals. They were clearly spinners and I photographed them several times. After being frightened by the helicopter with several passes they dove and one could see their dark shapes down near the bottom in the gin-clear water.

Not much else happened—dinner at the Balcs—very nice and good slides and such—to bed in preparation for leaving tomorrow morning.

September 4, 1951

At sea over Salmon Banks enroute to Lisianski Island

We piled all the gear into the back of a station wagon, pried John out of his sack (he actually miraculously emerged in time without us prying him, but we thought about it). It didn't take long to load the gear, ascend the gang plank, meet the Captain (Lt. Commander Smith—a pleasant, athletic-looking fellow who seems most accommodating), and to find our quarters. Erwin and I are stashed foreward with the crew while the others are in "Officer's Country" astern.

Before long we pushed off into the channel and began checking some buoys on the way out. I looked back to see if I could see the "green cloud effect" again. I had noticed it yesterday. It consists of clouds over atolls and lagoons turning faint emerald green on their undersides because of the hue of reflected light from the sea. A moderate depth of water over white coral sand produces green water, and if it is clear, a lot of reflection results. Under the right circumstances a cloud mass apparently colors up quite strikingly. I first saw some puffs of cloud drifting over the *Casuarina* trees and wondered if there was some sort of chemical fire near. To be honest the effect was probably heightened for me because I wore polaroid glasses, but it's there for unaided vision too. Polynesian navigators in open boats were supposed to have used the effect to locate lagoons over the horizon. I can see how it would work. I can also see how swell patterns could be used once you studied them. We passed about 20 miles south of Pearl and Hermes Reef today, a broad shallow atoll, and I could see marked changes in the swell patterns. Before we reached the atoll area the swells had become regular southeast rollers with no evident cross swell. By the time we were abeam of the Atoll the swells had become complicated by a cross swell, and finally before dusk it became even more complicated still, perhaps from some of the sea mounts nearby, like Neva shoals, or Salmon Banks. Anyway, with practice I'll bet one could learn a lot from them.

My day was spent on the bridge with only short breaks for food and an occasional break to rest my eyes, and especially my aching feet. Not a marine mammal was sighted. The sea was, in fact, remarkably dead, with only a scattering of little Bonin petrels to keep us company. These little fellows look like junior-grade wedge-tailed shearwaters, and one wonders if they aren't sized to compensate for the low productivity of the sea in which they operate. There were quite a lot of flying fish, however, and one oceanic white-tipped shark, but that's all, to compensate for the wind and sunburn I contracted.

Eric and the watch kept me company much of the time, telling me stories of this and that—typical past time conversation that always goes on on watches—what kind of car the lookout is going to get and why, if the finance company comes through, stories of Eric's days before the mast on the four-master *John Ena*, in which he sailed from Hawaii to Alaska to New Zealand. She made 22 knots top speed Eric said, and at 13 he was required to set the royals and stitch on new buntlines aloft underway. It's amazing how many of the crew and officers have taken a crack at being oceanographers, or who want to try. I get the impression that these are exceptionally capable seamen. Their boat has received several awards for excellence, more in fact I am told, than any other Coast Guard vessel.

After supper, very tired. I tried to sleep below but had trouble dropping off, mostly I suspect because it was new and I worried about poking Erwin's rear with my elbows when I rolled over. He, however, was so dead to the world he couldn't have cared less.

September 5, 1971

Lisianski Island, Northwestern Hawaiian Islands

I awoke this morning to look out the porthole and see the ocean light-apple green. Then I noticed that the engines had slowed. We were at Lisianski and were moving into our anchorage. I shook away the sleep, grabbed a cup of coffee and went on deck. Lisianski lay low against the water, a line of white where the coral sand beach lay, a broader stripe of green marking the naupaka and other beach plants, and an occasional larger lump of green made by the three or four *Casuarina* trees on the island. Lisianski is about 3 miles around, tops out at about 15 ft. above sea level, is generally higher toward the center but with some depressions where I am told one could dig for water of the lens. There is a lone palm and one stump. Around it on all sides is an extensive dissected reef. Ahead of us and astern of us now, for instance, we can see the water hump up and break over large coral heads.

Before the anchor was down the crew had lines over the stern and before the anchor was set two or three men were hooked up to large fish. These soon came flapping over the stern—20-40 lbs. ulua (big jacks) and you could see each struggling fish was followed by three or four unhooked brethren.

Gene had us ready our gear last night so we were quickly loaded into the whale boat (the two diesel work boats double as life boats—sturdy craft with much styrofoam flotation so that they can hold many men). We grabbed the knotted ropes as the boat was lowered away. The davits were not swung out but simply extended on a hand operated screw device with a ratchet that gave quick and positive lowering capability without the mess of swinging davits and getting rope falls tangled, etc. A crisp command as the boat hit water cut away the aft block and this was quickly followed by the roar of the engine, and then the foreward block was released (once again a fine strong handle-operated release simplified this often dangerous task). Once again I was impressed with the crew and they waited for the radio to be brought, and the first-aid kit. Drill to be sure, but well-executed and all of it crucial in any kind of sea state (which we did not have as it was nearly flat calm).

We were perhaps 2,000 yards offshore, maybe double that, and the boat soon reached the strand, nosing up onto the slightly tan but gleaming coral beach. We piled

over the bow, all of us passing gear up the beach. Soon this was done and we readied ourselves for the trek around the island. It was about 9AM by the time we picked what we would and would not carry. We toted gear to handle monk seals, and we left lunch and swimming gear. We will use those things when we make the circuit of the island.

Scattered along the entire perimeter of the island were monk seals. We counted 119 in all, including about 20 pups. Some of these we tagged with double stainless tags clamped through the webbing of the hind flippers. This required something of a gymnastic event. John Sincock was the "head" man, and he pinned the seal down with a pair of giant tongs that allowed him to grip the seal around its throat and to press the tong tips into the sand, thus holding that end. Then Gene and I (when I wasn't off photographing something) tended to the stern. We grabbed the hind feet and kept the animal from squirming loose. Gene then clamped the stainless clip in place with a pair of stout pliers built for the purpose. It didn't seem to cause the animals excessive pain, in fact their struggles seemed not especially involved with the actual act of tagging but instead with general restraint. They can snap and Gene says they have a vise-like grip. Their teeth are quite small, however, so I suspect they can't do the damage some seals can. Like as not, after the tags were placed the seal might snort indignantly and settle down in the sand again, not bothering to hump himself down the beach into the nearby sea. Many did, however, and some swam along a little faster than we were walking to come onto the beach again and to be disturbed again. One literally moved in front of us off several hundred yards, seeming not to have enough sense to avoid us.

I was impressed that these monk seals seem not to form meaningful aggregations. The groups were generally small and seemed to be very loosely constructed. One often saw 6-8 in a given area, and often there were pups involved. Dimorphism is slight and there seems no dominance involved at all. At night many seem to move up into the naupaka, forming the long chute-like trails I mentioned seeing on Kure.

As for temperature, before coming here I wondered how a seal could survive on the open beaches of the central Pacific where the relentless sun beat down. Well, it doesn't. These islands are quite far north (26 deg. N Lat.) and only subtropical at best. The water is tepid (78 deg. F), and the trade winds very constant and quite cooling. For instance, today, which was a good warm day, the maximum was 85 deg. F. To be sure it would be hotter on the beach, but not excessively so. The seals make depressions in the sand, like shallow rabbit forms. You can often see where a seal has moved toward the water and along the way has stopped to dig a depression. These are usually about 6-8 in. deep, and have a margin of sand piled around their edge. The animal's head is also in a depression that usually comes up about to his lower jaw. The body depression does not even reach his plimsol line. Some seals have sand scattered over their backs and heads as a result of digging and this must help protect them from the heat. Mostly, I suspect, they simply soak up the heat while resting and thus producing little heat beyond that needed for maintenance metabolism. The wet sand below, the breeze, and the sand serve to keep their body temperatures within bounds.

I should mention that perhaps 10% of the seals we saw were in the process of moult. In this process they become the most ragged looking creatures imaginable—tatters and tags of old skin hanging off everywhere with the glossy dark brown fur showing beneath. I doubt this is significant thermally, since so few animals in the population show the feature at any one time.

Once again, we saw wounded animals. The competition between seals and sharks must be a constant one.

Walking down the beach was to experience a constantly changing panorama of living things, of a remote strand covered with the floating flotsam of the sea. Birds rose from the shore bushes, nestlings craned and looked scared as we passed. Mother blue-faced boobies cussed us out if we came too near to their downy young, a few of which were still on the nest. Fleets of great black seplulchral frigate birds rose flapping from the beach heliotrope to soar effortlessly above us. Brown boobies zeroed in on us at about eye level and flew straight for us with their powerful flight, to veer above us, or hover, as they came near. Fairy terns lifiting like airy feathers from nearby bushes to swoop and hover about our heads, their spotless white plumage illuminated by the sun behind them. Bristle-thighed curlews strode along the beach whistling their plaintive two-noted call. I lay in the sand and tossed pebbles to one. His attention was instantly taken by this and flight turned to curiosity. He came near and only flew when I disrupted the mood by changing lenses on my camera.

Red-footed boobies were very common, especially the nearly grown grayish young whose feet were just turning pink. They sat in groups of dozens per bush eyeing us with more equanimity than most of the birds. Gene told me that the back of the strand was honeycombed with the burrows of wedge-tailed shearwaters and Bonin petrels. To walk there was to crash into some beast's living room with each step, and to risk the chance of cracking an ankle in the process.

Flotsam. Glorious flotsam. The beach was littered with it, and it became a good ruminating point to figure how one could use the stuff to make a living cast up on this island. The glass balls, which were present by the hundreds around the island could serve as burning glasses, where the glass blower cracked off his long blowing tube and left a convex surface. I felt sure I could start a good campfire this way. I will probably try it on Laysan. Then, the heavy net back in which some of the balls were encased could be unravelled for twine. Tattered hausers appeared in some places, partly buried in the sand, and they could be used to make fish nets and to tie rafters and the like. Several fine planks and long mast-like timbers were passed and they could help build a house or a boat. Some pieces of piling could do the same. Endless bottles, some gallon size and some graceful blue sake bottles would make nice utensils. The same could be said of the big plastic floats that could be cut in half and hot stove cookery practiced. I thought a seal or two would provide leather, steeped in bird droppings to tan it, the sinews would work for thread as would some of the roots we saw. The coral boulders would make excellent plaster, and one might even make a house whose walls were largely glass balls stuck together with the stuff. A well would reach the water lens, somewhere near the island middle, or even just in back of the beach.

A short net would provide a constant fare of fish. We noted big schools of mullet, 10-14 in. long in the shallows along many parts of the island. Moi were common, flitting like white ghosts over the coral sand on shallow beaches. Blanched aholholes nibbled at us when we swam in two-foot water next to the beach. Big uluas—20 lbs. or so—cut into water so shallow their fins broke water, trying to get at the rich shoals of fish in shallower than they could go. Any kind of hook with bird feathers would probably get them. Certainly a stouter hook baited with seal meat or a bird or two would lure sharks in. The deck of the *Buttonwod* was littered with them when we returned.

The rusted TV set, its tube still intact, seemed more valuable as a decoration, or a tie to civilization, than for a real utility, though some of its wiring would probably be useful. The two big steel drums would be so useful it would be difficult to figure out which use was best. Probably one would serve as a big foot preparation pot—to render oil from seals, or from turtle eggs (the reserve managers are cringing at all this imaginary slaughter of their precious (and mine) animals, I know, but we can excuse it in me since I am stranded and without food).

The lone coconut tree probably wouldn't help much but it might provide enough nuts, or other nuts might wash up, that a grove could be started. Then, in a few years it would be a staple. But by that time I guss I'd have to figure I'd be rescued. Its sennet would be useful as would its fronds.

By this time the flies began to assemble forces. They came in droves, in fleets, in echelons, in swarms, and clouds. All of us were coated with hundreds of them, attracted to our sweating skins and soaked shirts. Fortunately they were benign flies and didn't bite. They just sat, and swarmed and walked and tickled one and flew in your mouth when you talked. John solved the problem by suggesting that they were the tresses of a gorgeous blond who hovered over us from every angle. That did it, for a time, but after all, one can only take so much hovering from a gorgeous blond before such static activity (if there is such a thing) palls and you want to move on to something more rewarding. John didn't solve that.

Finally we made it around and retreated to the fly-filled space beneath one of the ironwoods with our lunch. We ate happily, considering the company, and plotted a swim, which we soon took in the milky water of the strand edge. It was delicious, just the right temperature and we felt vastly refreshed when it was over.

The shore boat came in, loaded with the ship's crew and they rapidly deployed out along the strand with yelps of joy at each trove of glass balls. In an hour or so they came back burdened down with great bags of them.

Back at the ship we ate dinner, and caught some sharks. I can't identify them—gray above, rather small teeth [drawing], white below, teeth subtriangular to pointed. The fin is large and subconcave posteriorly. They were up to about 8 ft. long and the boys caught them on ulua scraps.

We'll up anchor and head for Laysan—12 hrs. away.

September 6, 1971

Laysan Island, Northwestern Hawaiian Islands

There are so many things to tell it's hard to know where to start. I guess I'll start with dawn like mostly. When I got up it was still dark and the ship was surging along, its engines thrumming as if no island was yet near. Erwin, who sleeps above me, was up rearranging his gear preparatory to landing at Laysan. The ship's complement had decided to drop us and go to French Frigate Shoals to place some buoys, and then to return for us, rather than to wait. I view this with mixed emotions. On the one hand I like the idea of being left here with no support vessel, but I would also like to be able to debark at French Frigate and fly home—there is so much to do before we leave for Rome in October. This now seems unlikely as we will probably bypass French Frigate and there is no other place where I might catch a plane home.

Anyway, we couldn't see Laysan even though we were supposed to be only 15 miles distant. The sun rose through a towering mass of cumulus right over the supposed island. It wasn't until half an hour later that we sighted the island—a thin disc of gray against the horizon, soon punctuated by texture, formed of groups of coconut palms (a very few), scraggly ironwoods, and finally the wreck of a Japanese long liner, cast up on the south shore.

The whale boat was loaded with a great pile of gear, mostly of undetermined nature since it was in dozens of army green bags. We loaded the boat and Eric, John, and I jumped in—Erwin and Gene will come along in the next load. We headed in toward the reef, spotting a break in it where a nice little small boat cove rimmed with coral reefs but with a 50-yard-wide channel some 20-25 ft. deep leads in. Our expert coxswain guided his boat through nicely, cast out a stern anchor and nosed in against the arcing strand of rather steep coral beach. Gear was passed onto the sand making a massive pile, especially when we knew we would have to tote it all up to the crest of the hill some 30 ft. above through the naupaka. John, who has camped here a number of times before, trudged up the sandy slope and found the nice level spot with tent pipes already in place and marked out the approximate dimensions of our tent. Then we began the job of hauling gear. I guess, in aggregate, it must have taken 30 trips to get the stuff up the hill. It was hot and but for the blessed trade wind breeze it would have been well nigh intolerable. Finally after Gene and crew had brought in the final footlockers and the big rubber boat, we made it, stopping now and then for a warm beer. The tent went up, and then another one. I occupy the smaller one in regal splendor, with the other four in the big tent.

The island is quite a lot larger than Lisianski, and has a beautiful lagoon in the center, all streaked with rose red where it has evaporated to sufficient salinity to support red salt-loving algae. In its center the lagoon is blue and it is backed by a swelling white dune, and then, from our vantage point, the sea and sky beyond—cumulus, swirling cirrus clouds above, and no human but ourselves. Our camp is high enough that we can look around the entire perimeter of the island seeing sea beyond. It is a varied little kingdom and the people of Honolulu were right in calling Maximillian Schlemmer, Eric's father, "King Max". I told Eric he was a lineal descendant and we should by all rights call him Eric the First.

Offshore the *Buttonwood* hauled her anchor, let out a long blast, and soon all we could see of her was the tip of her mast bobbing along above the distant northern dunes, and then not that.

Eric and I decided to take a hike, tired as we were. My intention was to go along the beach but Eric wanted to trace out some of the scenes of his youth. So I started out without shoes, thinking it was going to be sand all the way but soon ended up looking for house foundations of Eric's house. We are camped directly above the anchorage cove and that is where the houses and lighthouse used to stand. They ran along the brow of the hill, the guano shed some distance off to the south. All we could find were some squared coral blocks from the foundation. All the rest was sand and clumps of bunchgrass (*Eragrostis variabilis*) and sooty terns. The young skittered along the trails between grass clumps, giving us the old broken wing bit and tumbling head over heels in their attempts to escape us. The larger bushes often supported a dozen or so young frigate birds (*Fregata minor*). Most sported a modified afro hairdo of saffron-colored fuzz

feathers. They looked frightened at our approach but would not abandon their posts. The adults, however, swooped overhead. Eric said that the sooty terns were saying “Eric’s back, Eric’s back” and I think they might have. Next we descended toward the lagoon and finally crossed the old railroad where Eric as a boy had loaded guano for moving it off to the little pier that once stood out in the southern end of the small boat harbor. The ties were redwood, and nearly all eaten and perforated where the spikes had pierced them. We found spikes, all flaky with rust and mostly gone into decay.

It is sobering to realize the near completeness with which all traces of Eric’s life and the many artifacts involved in it have been erased in the time between 1915 and now—56 years. We found rails—little thin ones—miniatures of narrow gauge, and then we came upon a pile of bones and Eric asked if they were mule bones. “Why,” I asked? “Well,” Eric said, “we had an electric storm and the mule that pulled the railroad car was struck. My father said, ‘Son, take out your knife and put it in the bush yonder until the storm is over. Otherwise the lightning may hit you.’” Eric said he followed instructions but never found the knife again. I was sure the bones were from a large domestic animal and almost certainly from Eric’s mule. Then we found an old violet-colored bottle, colored by years of the sun. It was of the old wine bottle kind and Eric said they had carried water in them. Father said, “Drink slow, that’s all there is till you get back to the house.” The tracks led around the perimeter of the lagoon nearly to the south end of the island. There stood the most lasting thing from Eric’s tenure on the island—a large pile of guano of low grade left by the buyers. The guano is found in sheets or sometimes layers as much as 8 ft. thick. It is hard and rocklike and has to be taken out with a pick. It seems to be formed by the solution of the bird droppings over many years, its percolation into the sand and hardening there. New layers of sand accumulate over the hard pan below and are in turn solidified.

They had called his father “King Max” during his years here, and later when the World War came they called him and his family squareheads, Eric said, since they were Germans. It was one reason Eric went to sea. The Navy wouldn’t take him—he was too young (13) so he turned to the square rigger. He describes getting up the mast and slipping and then being grabbed by a big Russian whose only comment was, “Boy, you get on up there”.

When Roosevelt declared the islands sanctuaries in 1909 it finally evolved that Max and family would have to leave even though he had leases on Lisianski, Laysan, and Johnston Island. He offered to manage these islands, kill the rabbits and so forth, but no luck. By 1915 he was off and the rabbits ran riot, and by 1923 the rail was extinct, the honeycreeper and the millerbird were gone. The moonflower on which the honeycreeper fed was decimated but survived. The island was nearly denuded of vegetation—the rabbits ate everything and then began dying themselves. They were then poisoned out in 1922.

Thus a far-sighted conservation effort became lost in the wilds of bureaucracy and the animals were lost. The organized protection of today has saved what was left and is doing so magnificently.

Islands like these are ecological vacuums. New plants arrive, their seeds stuck in the feathers of the birds, or on the boots or clothing of human visitors. The expanses of clean sand invite them in. The rains water the sand so it is damp an inch down and the interstitial air between the grains is probably saturated. These are hothouse conditions.

And then there is no organized competition. The weed thrives. Like as not it spreads like wildfire and forces old familiar plants into some restricted corner. Thus the puncture vine has spread. The *Portulaca*, the common weed of everyone's garden in the southwest, is unbelievably lush here and everywhere. Eric tells me that the soil is so rich in places that they were able to raise huge sweet potatoes, several pounds in weight.

We walked along the salt flat. Brine shrimp abounded in the inch-deep water. The bottom was red with algae. Brine flies swarmed in tiny clouds over the surface. Up above the margins of the water was a gooney nesting ground, dotted with the big oval white eggs, the infertile ones, and the bodies of birds that died. The grounds are jammed with hundreds of birds in nesting time—really many thousands. The birds like the open area to take off. Heavy vegetation prevents these 8-footers from becoming airborne. The gooneys come in around the first of November and before long their enormous chicks, all covered with down, stand in droves over the surface. There are other nesting grounds for these birds—two species—the blackfooted and the Laysan albatrosses—up on the hills above. Now these grounds are preempted by the raucous sooty terns.

Over by the guano pile Eric looked for an old fresh water pond, now choked with *Ipomea*, the beach morning glory. What looked like devil grass had also grown in this area, forming a very pretty warren—the green grass below and the seed stalks showing velvety brown above. I enjoyed walking in it in my bare feet too. I had planned to walk the beach and hence had brought no shoes, but Eric misled me. So, together we picked trails through the *Tribulus* (puncture vine). Mostly I escaped but occasionally one of the nasty spined pyramidal seeds would nail me. Eric was an expert at spotting them, having run the island barefooted as a youth.

We walked up through the thickets of naupaka and at the very south end of the salt lake scared up two little Laysan teal, and away they flew, rather heavily, I thought, as if not used to flight. Perhaps they had been nesting in the deep bushes, as I understand they do. Their numbers are low—only an estimated 50 birds lived here last year. However, later at camp John and Gene spotted over 120 coming out along the salt pond margins just at dusk. They reacted with visible relief since previous evidence had indicated some unexplained decline. The best count in recent years is a bit over 200 birds. They are compact brown ducks with a very marked whitish patch on the side of the face, and while not flightless, they seem unwilling to make long aerial traverses.

We reached the beach along the booming surf of the south shore. Here the protecting reef is absent and one can look out past the narrow shoal into the deep Pacific. The swells roll in and crash against the headland and beach. Right where we emerged was the wreck of a Japanese long liner. She plowed into Laysan doing 8 knots, in 1970. The beach is strewn with bales of line, of floats and flotsam, of old boxes bearing Japanese labels. The boat stands against the constant pounding of the surf, which squirts up through the scuppers and over the well deck.

I was fagged out by this time and took five on the top of a slab of consolidated coral rock, doing what Eric calls “putting her on the slow bell”. Soon enough we rose and slogged through the sand again. Here the shore is margined by slablike headlands of this same coral rock, making a most un-central Pacific-like scene. Most rock here is volcanic and seldom does one see such angular shapes standing against the sea. To the north, this formation cut into the sea and behind it was an enormous long tide pool. The water poured in at the south and literally ran as a stream northward. It cascaded and

tumbled over rocks in the most approved stream fashion and if you didn't know it was seawater you would swear you were walking in a fresh water creek. Finally, it poured into a big boiling pool in which one could see the surge of the sea. The swells outside the 15-ft. rock wall came in through a crack and at the same time I could see plumes of spray above.

We skirted the shore. I found a dead monk seal high on the strand and took what I could of his skull. I hope to send it to Professor Chapsky of Leningrad, a world seal authority who said his museum had none.

Monk seals were common on this shore—I counted 65 between the wreck and camp. All were sleeping blissfully in the sand. One beach they occupied was made of rounded and polished shell bits. The polish was high enough that the beach gleamed in the afternoon sun. The opercula of snails were common and highly polished as were fragments of many other kinds of shells.

I stopped for a dip in the harbor—blissful swishing back and forth in the cool water, washing away the sweat and grime of the hike. Then I walked naked to camp, letting the air dry me off. Erwin berated me for my lack of modesty and I gave him a blast about his decadent white protestant moral structure. By that time the sun had dried me and I put my clothes on anyway.

At dusk we had a toast to Eric. Gene hauled out a chilled bottle of champagne and we toasted the return of Eric, as the sooty terns had done earlier.

Later, as dusk fell the air began to swarm with returning Bonin petrels and wedge-tailed shearwaters. Intermixed with them were sooty terns, who probably didn't want to miss any of the action. I suspect they are that kind of bird. The air swirled with them over the entire island, planing close to the tops of the vegetation and skimming past our heads. Later I walked away from camp and lay down on the white sand amid the bunchgrass clumps to watch them. Often they skimmed in pairs, commenting raucously to each other as they flew. I heard perhaps 8 different kinds of calls, most, I suspect, from the Bonin petrels. One landed a foot-and-a-half from my face. He came in fluttering and crashlanded, tipping over on his beak with a little bump and then looked foolishly around as if to say—"I hope nobody noticed that lousy technique." Then he extended his neck, making him long and thin and waddled off, his body close to the ground. Others landed near. They were feisty with latecomers, greeting them with long, wheezy growls until one bird fluttered into the air and skimmed away. I doubt that they seek a special place to land, except the petrels which go down burrows, for later I found them sleeping in the open, with their necks bent and heads under wings. The light of day was fading into the last rose flush on the horizon and on the towering cumulus. Bunchgrass fronds waved in the sea breeze, dark silhouettes against the sky. Amidst this skimming birds flew two or three ft. above my recumbent head, hundreds of thousands of them. The bird maelstrom dissipated as evening fell, though many continued to fly all night.

A word about Laysan finches. They are everywhere. John estimates 8-10,000 on the island. These little birds look startlingly like the medium-billed geospizid finches of the Galapagos Islands. They are neither geospizids or finches, but honeycreepers—family Drepanidae. The same group that underwent the adaptive radiation on the main Hawaiian Islands, these little fellows are curious and if one sits still they will hop over and even climb on your legs. They seldom fly but mostly hop in amongst the underbrush

inspecting this and that and picking at tiny bits of food too small for me to see. Their bills are heavy and the upper bends over the lower as a fine sharp point. The adults have a lemon yellow flush over their upper body and head and variegated brown and tan plumage elsewhere. The patter is very reminiscent of the house finch, substituting yellow for rose. One cannot help but be amazed at the specificity of evolution in producing these forms in relation to very specific aspects of the environment. I think this specificity is even more precise than most biologists tend to believe, extending to precise body forms and feather patterns, the minute details of food getting, and likely also of physiology. In other words what have sometimes been called orthogenetic trends in evolution are strong. Given reasonably similar material evolutionary process will mold remarkably similar forms even to features like calling pattern, in similar ecological circumstances. This reflects back and makes one realize the pervading precision of adaptation in which feather patterns and all the rest have meaning within the adaptive norm we call an organism.

To bed. Nice rains shower tonight, near dawn, thrumming on the tent and getting my walking shorts outside saturated. Washed my towel too.

September 7, 1971

Laysan Island

The work for today consists of three tasks—first we have to plant the crosses to Eric's brother and another nameless person, and next we have to circle the island to make a seal count (I'll check the beaches for whale and porpoise bones), and finally we will make some sort of count on the Laysan Teal in the evening. We started out well enough, going northward to the bench above the tide where Eric's brother and the nameless woman were buried. Eric bore a cross, like Jesus, across the flats ahead of me. He had located the graves the day before by memory and by use of some photographs which showed the position of the reefs. He found them quickly enough—the old gravestone of one was still standing in spite of the high tides and storm waves of 1969 washing around it. The second stone was missing. We placed the crosses, Eric put a few net floats and one nice dark green wine bottle reverently in the form of a cross over Adam's grave. "Adam Schlemmer" it said, "1896". The other cross was for a nameless Japanese girl who died in childbirth. I objected that they weren't burying the crosses deeply enough to withstand the tides. But they went on oblivious to this so I provided heavy rocks to stack around the cross shafts. Then I thought, "If the railway and all its ties can nearly disappear in 45 years isn't it obvious that all we provide with such a cross is the commemoration of a life beyond its time, and in a way that increasingly becomes remote with time. Adam Schlemmer, who was he?" Well, in actuality he was nobody, only a tiny mote of life too young to have entered the stream of life as more than a mere blip. Today no one knows, not even Eric, of his smiles, his disposition, the love his mother felt, or the searing sorrow at his passing. Adam Schlemmer, one twentieth of what he was, painted on a cross that may be downed by the next tide. What's different elsewhere?

So, why bury the crosses deeper? The major meaning was achieved at the moment we buried them, the moment Eric, in his partly understanding way, commemorated the flow of life, and its end, by placing his pretty green wine bottle over where he supposed the grave to be.

We walked back, I, up the hill, stirring up the sooty terns who cursed me as I disturbed their children. The children, in their turn, used every wile on me, broken wings tumbling, getting tangled in the bunchgrass, but I plowed obliviously on in my giant way with only the remotest feel for the fabric of their lives.

Then came plan component No. 2—the hike around the island. It would use up much of my supply of vitality for the day. It's six miles, slogging through the slipping soft beach sand, in the glaring sun, and I was glad it wasn't seven. Interesting though, and I'm glad I tried. We started out to the south. John and Gene plowing ahead with their notebooks and the stretcher with which they subdued seals. They tossed it over the apprehensive seal, or often enough, a sleeping one who awoke with a start surrounded with fabric darkness and fright. Their modus was then to expose a flipper, or better, two, from under the canvas while John rode around grasping the throat of the snapping jaws. Gene pulled a flipper from under the canvas and snapped a stainless tag in place. It bore a number keyed to date and place of tagging. The snorting indignant seal then shuffled off for the water, rolling his eyes and humping over the coral ledges. It was even more arduous when a yearling was found with a tag in place. Then he had to be corralled and the tag read but in the intervening year he had gained greatly in size and strength. Thus these encounters were often fencing bouts with the seal being forced into partial quiescence while one of us snuck around the rear and tried to read the tag. Often enough any touch of the flippers elicited a throaty roar and a rearing of the animal with mouth open and teeth ready. No one was bitten, however, and 245 seals were counted and inspected.

I watched them phonate on shore. The roar was overt with the mouth open, but often enough a "glunk glunk" sound was made with a swallowing movement with nostrils closed and the larynx being pulled backward in evident muscular movement concurrent with the sound production. I guess that they produce this same sound underwater and that no air is lost.

We walked south along the route followed the night before. Past the river of salt water, and past the Japanese long liner, and then to a magnificent shoreline where a reef of tabular rocks juts into the sea, a lagoon behind full of crystal water. Each wave crashes over the rocks, swirling over them and pouring in cascades into the lagoon behind. Some of the rocks have been etched into grotesque shapes that stand in the lagoon—fluted fingers of stone standing from the crystal water. I noted rudder fish and sergeant major's cruising along, as well as maninis. The two seal taggers were far ahead by this time. I was bothered by a *Tribulus* spine that had pierced my rubber wading shoe and poked my foot with any heavy step.

Later we rounded the southeastern tip and came upon the great sandy beach that forms most of the eastern shore. It must be the home of thousands of gooneys in season. Their eggs are scattered about as are innumerable glass floats and other flotsam. I looked in vain for cetacean bones. It came to me that this island is one of bird shadows. You walk along alone and then shadows of terns and frigate birds streak silently over the sand around you. You know that not far above you the birds circle and swoop. Very often one tends to have a retinue of such curious onlookers, often screaming their heads off.

The beach broadened into a great sheet of undulating sand perhaps 300 yards wide in places. It must be shoulder-to-shoulder with gooneys in season. Even now, when the birds are gone one can see the depressions made by the birds lying next to one

another like the cells of a honeycomb—each 2½-3 ft. across. I zigzagged back and forth across this flat looking for marine mammal bones and nary a one did I find though it looked ideal for them. The waters around these islands must have very few, though I know some of the oceanic species must visit. I came upon a group of fairy terns resting on a big coquina boulder and true to form they fluttered up from their rock and hovered over me, sometimes within 6 in. or so, always making their twanging rubber band noises. They are like peanuts or popcorn or potato chips . . . they're addictive and one can never take just one. If you have a camera the sight of these immaculate birds fluttering so near will induce you to shoot pictures again and again.

The sun beat down hard by this time and but for the sea breeze the hike would have been quite uncomfortable. We were all tired from slogging in the sand—its two steps for one on solid ground, I figure, in terms of effort expended. Gene and John were sweat covered from their continual bouts with the seals, which lay scattered completely around the island—there is no rookery. The only choice seems to relate to the nearness of a sandy slope up which they can climb at night, often into the *Scaevola* bushes. The very broad beach was not so attractive.

We slogged on—around the northern shore where when I stopped for a rest a beautiful green and blue parrot fish came in the shallow water almost to my feet.

Back at camp I dropped my pack and a monk seal skull I'd found and headed for the cove and a cooling dip. Pure delight.

In the evening just before darkness came, Gene, John, and I started out for the central lagoon to count Laysan teal. Erwin has been having leg cramps and so stayed behind and Eric was doing some fishing with a feather jig. The three of us, with flashlights and notebooks, slogged down through the shearwater and tern nesting ground to the lagoon. The ducks come out of the heavy vegetation at dusk and feed on the lagoon borders. We encountered a pair right at the water's edge. They are chunky little birds with orange-red legs, a brown body, a dull-green wing speculum, and a variably expressed white patch on the cheek surrounding the eye. One of the birds was feeding on brine flies, which must be one of their staple diets. The duck walked along, its neck outstretched, its bill chattering, as it engulfed the clouds of flies hovering just above the salt-laden algae.

Gene left me and I hiked southward along the edge of the salt flat in the gathering dusk. Darkness comes quickly here. I hadn't walked more than 1/3 the length of the lagoon before it was dark enough that I could only see ducks by their silhouettes. All I saw were at the water's edge and most swam nervously away from me, especially later when I shone a flashlight on them, or rose from the water a few flew a dozen yards. One got the impression that they would not expend enough effort to fly to the other side of the salt lagoon. The numbers increased as I approached the south end. There the morning glory, *Ipomea*, is densely tangled over a variety of kinds of bushes, and in them the teal spend their days, emerging at night to walk along the edge of the salt flat.

My count ran into the 40s, and was larger when I returned in the dark, making the count wholly by starlight, the moon not yet being above the horizon.

At one point my hat flew off in the wind and began rolling away from me. I thought it would flop flat and I could walk leisurely over to it. But no. It rolled on and on, like the gingerbread man. Since it was precious to me in this sunny, I took chase and was soon running about as fast as I could go with the hat bounding along in front of me.

I gained though. Finally, about out of breath, I came up with it rolling across the white flat. Should I dive on it? Or should I try to stamp on it, or simply follow it until it stopped. It showed no signs of doing the latter so I tried to stamp on it. I hit it, and my foot slid across the white surface, which proved as slick as grease. It was not salt but bleached algae and just beneath the skid mark left by my foot it was bright orange. I landed with a grotesque “whump” on the surface, and all out of breath I saw my hat had stopped. Catching breath I reached out and grabbed it, and returned to meet Gene and John, who had been hunting on the opposite side of the lagoon.

Back at camp we toted up the total sightings and they showed 149 birds—a very heartening increase over the last count, a year ago, which showed about 50 birds. To be sure, we saw no young, and our count simply indicates that the previous count was in error.

A little camp story telling, a nightcap and to bed.

September 8, 1971

Laysan Island

Finch day. John Sincock is the Sport Fisheries and Wildlife man on Hawaiian endangered birds and so he laid out a set of transects, each 100 yards long and about 16 ft. wide, that are dotted over the entire island, covering all kinds of habitat. I drew transects 30-60, which were located to the south of camp on the west side of the lagoon. With a counter in hand I located the transect area, using an aerial photo supplied by John. On it were spotted the transects. Then one trudged through the sandy slopes and grass and birds till he found about where to begin. It took me 66 paces to cover the 100 yards and so I walked slowly along, clicking any finches I saw as I counted paces. Taking such a traverse makes you peculiarly susceptible to crashing into hidden burrows. When you are normally walking you exercise a remarkable amount of judgment about where to step and where not to. The transect regulates stride and to some extent course. Hence I found myself plunging into these burrows time after time. I laced my boots clear to the top which helped keep most of the sand out, but after the 50th crash nothing much would save my disposition. The finches love the *Portulaca*, and they cluster around the beaches and especially in the naupaka where the frigate bird nests are located. They are tame little guys that will hop right up to you if you sit still.

My course took me past the old railroad so I picked up a tie and a piece of track to make Eric an assemblage of Laysan.

At camp, a little lunch, a little water and a short snooze, and then out to the lagoon to photograph. The algae is very pretty as are the bubbles forming a white froth at the edge of the water. I was able to get photos of teal from quite close. They much prefer to walk but will fly in quite acceptable duck-like fashion if pressed. They love the *Pluchea* thickets on the far side of the lagoon, and there I was able to get quite close (25 ft. or so) and to get a good series of pictures.

The walk back took me by the little palm grove at the north end of the island. There are 9 big trees and as I recall, 4 small ones. They look in remarkably good shape though one can see the streaking of droppings on the fronds from the perching or flying birds. This sort of treatment has kept the ironwood from growing very well.

It's dusk as I write, sitting on an emergency radio kit, with my typewriter on a Kirin beer box, and the air has become literally swarming with returning shearwaters and

petrels. To the south, where we can see the farthest, the sky looks peppered with swirling birds—thousands upon thousands of terns. I asked Eric if it was like this when he was a boy “Oh yea, they always came at night.”

September 9, 1971

I took it on the slow bell today, as Eric says, not doing much of very violent exercise. I swatted the ubiquitous flies after breakfast (they get up exactly at dawn) and took a snooze. Our work is essentially done and we can do what we please. My pleasure was a snooze sans flies. Later we tried for recordings of the monk seals. I readied my gear and was floated out into the lagoon in the rubber boat. Gene and John walked along shore towing me and chasing seals into the water. I heard nothing but snapping shrimp until one yearling became curious about the boat and circled under it, actually going up to and inspecting the hydrophone. He was uttering a series of quiet little grunting sounds as he came. They were loud enough to hear over the snapping shrimp but the recording is not a very good one. After that was completed I took a swim with face plate and fins. The water is clear and over the white coral sand many of the fish are just ghosts of white as they streak along—especially the little goat fish.

I hiked to the north end and took some wide-angle shots showing the lagoon and the nine palms. I was challenged by a male frigate bird who was trying to steal a tern child (to gulp down unceremoniously if he could catch the parents away, which he did not). He even swooped on me, coming within inches of my unprotected pate. As he swooped by I could see his folding red throat pouch that told me he was a male.

Gene and Eric had gone down directly east of camp toward the lagoon to look for an old bottle pile (Gene is a bottle collector) and to dig for water. The first hole halfway between our ridge crest camp and the lagoon was 5 ft. deep before they quit. The next, perhaps 5-6 ft. elevation-wise above the salt flat and located just above the reach of the *Ipomea* thicket, struck water at about 4½ ft. Since it seeped in from uphill they assumed it was fresh. We will check tomorrow morning. I assume it is good water as all these islands have a freshwater lens made of rainwater that floats on the underlying salt water. It is usually a very adequate supply. Witness the fact that Midway uses this source for its waste water system for 2,000 people. Midway and Laysan are not much different in area.

I gathered up my tape recorder and the microphone to try for the airborne calls of the monk seal. I walked away from camp toward the graves to the north, and somewhat beyond them came upon an old adult seal sleeping in the grass clumps. I found the seal because it was sneezing periodically.

I crept up on my belly and stuck the mic through the grass at the seal's nose. It obligingly sneezed, and then woke up. He sat up with a wheezy roar, also recorded, and then began to emit the peculiar “glunk glunk” sounds. Later as I recorded a series of seals south of camp I was able to watch the mechanisms of sound production a little closer. They are best seen on the young and yearlings where the blubber coat does not obscure the internal movements quite so much as it does on adults. The sneezes are used in aggression, or defiance is perhaps a better word. The nostrils are suddenly blown open with a violent snort. The roars are made with mouth wide open and air being forced up past the tongue which is arched up against the posterior roof of the mouth—I don't think the vocal chords are involved—only the force of air past the palate and rear tongue. The animals often lunged at me during this exercise, especially the older adults, who

sometimes pursued me for a short distance. It was with minor joy that I noted their teeth to be ground flat. Likely they can gum one with a vengeance, however.

The glunk glunk sounds, which very likely are also produced underwater, are done without release of air and are produced concurrently with movements of the larynx—a drawing posteriorly of the apparatus and some lateral swelling, not marked, were noted. The nostrils are tightly shut, and the mouth may or may not be open during the production. I could not be sure whether or not the pharyngeal pouches of the larynx were or were not involved, but this may have been the swelling I noticed.

After dinner (spam, beans (from an old can left by the air force, but perfectly good after some years in the sand), vegetables, Bristol sherry, and cookies), we talked of this and that (retreating a couple of times for rainstorms that swept over us in minutes), watched the evening arrival of the sea birds, and then went to sleep, the trade wind working the tent. About 3 AM I awoke to a loud chorus of crooning wedge-tailed shearwaters just outside the tent. I readied the recorder and crept out, microphone in hand, to within a few feet of the calling birds. These birds are built for the air. In the bright moonlight I could see them creep along on their grotesquely short legs, their long bodies rocking like a pitching ship as they waddled along. They came at each other, head to head, began a crooning match and then began preening each other's heads. The call is difficult to describe in words—a rising clear whoooooo that sometimes warbled toward its upper notes—about as high as the middle register of a soprano—and then switched to a resonant inhaled groan. I was able to mimic it quite well and to interest nearby birds enough that they came waddling over toward me, coming within a foot or so before they became confused with my lack of preening activity, even though I had announced I was ready for it. My calls often induced the whole neighborhood. In fact, they did quite as well as my playback of their own calls.

A word about lizards and crabs. There is a little skink on the island, unlike any I have seen on the main Hawaiian Islands. It has a spectacle over its eyes like that of a snake, two paravertebral dark stripes and a general tan coloration. There is a greenish yellow metallic cast to the belly. They are little fellows—to about 4 inches long—and one often sees them skittering amongst the underbrush. We captured some by pulling up grass clumps down by the ironwood tree. I saw them sunning, lying out on open sand, but always near a retreat. I'm sure they must be succulent fare for the many birds always around them.

The crab is a little mottled white guy, like a ghost crab, and it makes vertical circular burrows over much of the island. We found them common amongst the grass roots. I wonder what they do about salt? How do they moisten their gills?

September 10, 1971

Laysan Island, Northwestern Hawaiian Islands

The boat might come in today, though we expect them tomorrow. After breakfast we hiked down to the well to test the water. It is sweet and pure as any from our jerry cans. Furthermore, when we scooped it out it ran back in so rapidly one could see little boils in the coral sand. It came from a stratum of hardened coral like rock at the bottom of the pit. It's my guess that if we dug down 3-4 ft. more we could have an abundant supply of excellent water. Eric makes the suggestion, and I think it is a good one, that once the well is deepened, a plastic pipe, perforated at the bottom, should be put in that

the hole filled with rocks and pebbles, and then a small hand pump installed above ground level. Likely a continuous source of excellent water could thus be had. In any event we have no problem with survival here. There's abundant water and the island can provide all the food one needs, from greens of a New Zealand spinach-like plant, to lobsters from the reef, to fish, to grapsid crabs, to seals, to mutton birds (the young shearwaters), and who knows, a broiled frigate bird might be tasty. For those addicted there is true tobacco on the island, brought in by the early settlers. And for booze Eric reports that one can ferment coconuts and that his father made beer (most ingredients no longer available).

Later in the afternoon Gene, Eric, and I went south and picked up some railroad ties and traced the little mule-drawn line back toward the harbor. We could follow it by the scales of corroded metal in the sand and once in a while a tie or a hunk of track would protrude. In 1969 there was a storm and one can see the old strand line, marked in flotsam, at about the level of the back wall of Eric's old cookshack. This would effectively have taken out that building and the guano house where the railroad ended, if it hadn't been washed out earlier. At any rate it is gone now.

The rain caught us and I had to shelter my camera under my shirt while Gene took shelter in back of a clump of bunchgrass. Either way we got pretty well soaked but the cameras didn't suffer. These storms blow across the island in the trades and one can see them coming—a gray veil sweeping across the far sand hills, the lagoon and up the slopes. Most are just clouds and they pass in a few minutes, but some dump quite a lot of water in the few minutes, but some dump quite a lot of water in the process—enough to soak clothes and anything else outside. Gene got a nice bath from the water of one that collected on top of the tent. Eric reports his father had them get on the roof with brooms when such squalls would come. First they would scrub the bird droppings off in the first moments of the rain and then they would switch the spouts into barrels to catch the good distilled water. He said they got a lot of their water that way, and the rest from the wells.

I was surprised to learn of the size of the guano operation—they had 15-20 Japanese working at a time. I asked Eric how he did school work and he said his sister taught him on a sort of intermittent basis. He later took a series of correspondence courses in electricity, wire slicing etc., and finally worked his way up in Hawaiian Electric, in spite of a lack of formal training. I'll bet he was good both as a worker and as a supervisor.

We had a swim at the cove, an almost sinfully sybaritic affair. The clear water laps on the clean coral strand and one can drift back and forth in water of exactly the right temperature—I'd guess it at about 71-73 deg. F—a little cooler than Honolulu. We dried in the sun and headed back up the hill. Some gear is getting packed now and we try to take some down to the beach with each trip.

Boned chicken and boneless ravioli were on the menu tonight. Followed by the last of the Bristol sherry or vodka and orange juice as the case may be. Eric and I washed dishes and watched an oil slick spread from the remains of the chicken. That little bit of chicken fat put a slick over about 2/3 of the bay and finally swept clear out the entrance. Amazing, and it makes you realize that such slicks probably exist over every bit of shore water in populated areas. A well-oiled (suntan) young lady slipping into this bay would have donated as many molecules of fat as our chicken.

After supper Eric and Gene engaged in a donnybrook of a cribbage game in which Gene wagered Johnston Island against anything Eric could name—Africa, South America, and emerged with them all. Poor Eric. He entertained us anyhow with ancient songs and ethnic jokes. Eric makes ethnic jokes out of any run-of-the-mill joke. They teem with rabbis, priests, and ministers, etc.

To the sack. Later I got up in the moonlight to look at the seals. They sleep all day. We find them in the morning up on the vegetation above the tide and by afternoon they have moved down near the water. By the time I got there they were back up in the vegetation. Sleeping. I have seen no social behavior and very little social interaction. The only thing in this realm is occasional disturbance of one animal by another. There seems no grooming, no signal systems, only three kinds of calls, and I suspect they feed in the early evening and that it is a pretty simple process as they are back asleep before many hours. A remarkably uninteresting mammal, behaviorwise.

September 11, 1971

At sea, enroute to French Frigate Shoals or French Frig as the seamen call it.

The *Buttonwood* was here at dawn, anchored out beyond the reef. The morning was spent breaking camp—cleaning up, smashing cans, toting gear, folding tents, etc. We left it nice and clean. The crew came ashore and raced across the island for glass balls. Some came back with enormous bags bulging with them. I wonder how long it will take to replenish the supply. Plastic ones make an increasing fraction of the total now, and may ultimately replace glass altogether—mores the pity, the glass is more attractive. By the way, my desultory attempts to find a ball with a natural magnifying glass on it failed, though I still think the idea has merit. A swim in the cove, loading on the ship, and a nice lunch (the biggest meal we have had since going ashore) and up anchor at 1630 for French Frigate Shoals, with a stop at Gardiner Pinnacle on the way.

Just at the edge of the bank on whose top Laysan lies we encountered 2-5 *Tursiops*. This point is 5 miles east of Laysan and the water is 100 fathoms, dropping steeply into the depths. The animals cut over close to us, but, I believe, never ran the bow. I raced for my camera and clambered up onto the bow. I had on the finder and everything set but the camera wouldn't fire—it was on "lock". By the time I fixed that they were gone. But I did get a sure sight identification.

More watching until dusk was fruitless. The number of birds dropped markedly as we left Laysan though we continued to see some Bonin petrels until dark. They must operate on a two days or more at sea schedule, with a visit to an island in between. I couldn't see how the flight track of the birds, at least these petrels, could be used to locate an island. Boobies might serve better since I believe they come in every day.

Ensign Al Sarra took notes and photographs of porpoises seen when the *Buttonwood* left us and headed for French Frigate. They had four sightings as follows [details of sightings].

Our trip to Gardiner continued uneventfully and we finally raised the tip of the largest pinnacle about 1240. By about 2:30 PM we were within a 1,000 yards or so and readying the rubber boat for the trip ashore. I asked Gene if I could go and he assented. The sea is quite calm with only a rolling 2-3 ft. swell and little wind. The task here is to look at the birds and to gather some hard rock samples for age analysis. I'm along to collect invertebrates and to see if perchance a lizard might have made it to this remote

spot. It is a saddle-shaped pinnacle of rock with a smaller pinnacle to the north. It is guano-covered and shines white from a long distance. I'd guess its length at about 300 yards and its width at 150. It stands nearly 190 ft. high. There is no real landing place. We went in with the rubber boat, nosing it against the sheer wall and waiting until a swell lifted the boat enough for a man to hop ashore. Gene was at the bow and lost his footing. He turned and did a neat little dive, swimming out to the boat where we hauled him unceremoniously aboard. He tried again and this time clambered up above the tide and the slippery rocks. I tossed him the bow painter and climbed out myself, sliding enough that I spreadeagled myself on the rocks and finally made it up. John landed with more aplomb. Gene, bless his soul, commemorated the landing by hauling a cool bottle of Lancer's Rose, with which we toasted our success. Thus fortified we clambered up the rocks toward the top. The Air Force had blasted the top flat for a helicopter pad and had put up a theodolite base. Com wire was strung over the rocks.

Birds were everywhere, including one new to me—the blue gray noddy tern, a pearl gray version of the fairy tern. Why it is called a noddy escapes me because it looks for all the world like a fairy tern and acts the same. I saw a brown booby on a nest that had pale yellow-green feet. Most have nondescript browning feet.

As for insects the rocks sitting in little pockets of soil revealed beneath them wolf-like spiders including some quite large ones, very large silverfish (to $\frac{3}{4}$ in. or so), earwigs, a millipede, and pill bugs. There were no flies that I noticed and the only plant was a very occasional patch of very beaten *Portulaca*. Most of the rocks, especially toward the top of the island, were smooth with guano. Some of the rocks had their upper surfaces almost glossy smooth with it, and if you could look under an overhang you could see that it flowed down over the rock-like pancake batter, and even hung down in little stalagmites. The bottom of the rock was uncovered.

I photographed the birds and my hiking associates and unfortunately missed Gene's fine dive and a subsequent one when he tried to enter the rubber boat.

As for rocks, the basic rock is a basalt, with olivine inclusions common toward the south end of the island. On north rock, two 2-ft.-wide dykes run nearly vertically, and on the upper part of the larger island what I take to be xenoliths are common—large boulders entirely surrounded by other rock. At the south tip there is a reddish rock of almost sandstone-like texture, which I expect is a weathered basalt. Some of the upper rock of the main peak looks almost like a rhyolite to me. I took samples and pickled a lot of insects and allies.

Gene landed briefly on the north rock and then we made it back to the ship for dinner and a shower. Several crew members had caught ulua—big guys in the 40-lb. class. One reported having a milling mass of perhaps 50 uluas around, and outside them a frenzy of sharks, one of whom clipped the man's line. Wow, it's never like this on the main islands.

After dinner Eric showed me his pictures and the log of the *Helena* and other interesting papers.

I've been having muscular aches of the chest and shoulders and can't seem to shake them. Sometimes this seems connected with histamine production—a sort of bursitis—and a cold tablet helps. I've taken some and we'll see. Oh yes—we saw three seals at Gardiner—two on the rock and one on the main pinnacle.

September 12, 1971

French Frigate Shoals

When we awoke this morning French Frigate Shoals was in sight. A row of white-walled tin-roofed buildings on a low, flat island. The edges of the island were sheet piling where dredging had extended the land area from a small sandy mote of land into an air field. The buildings are all tucked off to one side of the field and there is very little area other than the field. Fortunately the planes only come in once a week so the station crew can run on the field, can zoom their little two-wheeled cycles around, and can run the lonely weapons carrier around. The last one they drove over the edge of the piling into 30 ft. of water. One seaman, watching, saw it all, but failed to report it until the day after, saying "It didn't seem like any of my business." The CO, a young JG named Monsma seemed like a bright guy. He has about 6 months left on the island (they stay for a year). And he seemed to like it OK, though he had been told of the horrors of French Frigate. Some of the loran stations in Greenland, for instance, where they have to "cut their water with a saw" would be a lot harder to take.

Our ship's boat was having troubles. Its engine filled with smoke when we came over—the exhaust pipe had disconnected and later when they tried to take off to the ship it began to fill with water. We found them sinking just offshore and being saved by the truck and its winch. We borrowed the station outboard which was only a little better. Later we had trouble starting it—the starter cable wouldn't engage and other problems. But we finally got back. Gene, Eric, Erwin and I checked the islets around the lagoon. First we visited Eastern Island, where the old station had been. It was an unbelievable mess of old boards covered with guano, old machinery and so forth. The birds, of course, didn't mind; in fact they used whatever was available to them. There were a few seals, boobies, terns, and the like on a very low island mostly covered with much-battered *Tribulus*. The chief distinction of the island was its turtles. The land was pock-marked with the burrows of turtles, like shell holes from a war, over much of its area. Gene found one new one, where he thought the young may have emerged recently. I found a couple of dead young.

We left Eastern Island and cruised over the very extensive reef flat. It is rather shallow—in most places it's probably not much over 30 ft. deep, very clear water so that features of the bottom are clearly seen. The shallows are marked with brown or sienna, where heads come awash. Over coral sand the sea is light turquoise, in deeper water it shades to rich blue. The sandy islets and breakers mark the surface with brightest white.

On Whale and Skate Island we pulled into a shallow reach, secured the boat to a stump buried in the sand, and walked the beach. On the offshore side I watched a school of blue ulua cruise the beach, indian fashion. Each fish was of moderate size—probably 5-8 lbs. When they encountered a school of bait fish at the water's edge the fish left a hole of vacant water for the predators to occupy. This hole moved along with the fish.

We were to make a radio call at 12, and the difficulty of getting the motor started caused us to bypass Trig Island with only a cruise around its west end. On all the islands, seals occupied the shore. They are remarkable sleepers. I noticed one of Whale and Skate that was sound asleep with his head below the lapping surf. I guess he must have raised up periodically for a breath but I never saw him do it.

At the station we had sandwiches in the little restaurant (make 'em yourself) and a couple of beers. Then Eric and I went back to the *Buttonwood* where a beer bust was in

progress. The failure of both ships' boats required that it be on the ship. I had forgotten how the entire hierarchy of a crew is established by physical force, and maintained the same way. A couple of crew members became obstreperous and mostly were put in their place by the Boatswain's Mate, by simple threat of violence, in which he believes implicitly. It's not far to organized violence, or combat, for these people, and in fact it is familiar to them and completely sensible.

The ship lies at anchor just outside the channel and will take off tonight for Necker Island.

As we came in to anchor this morning we passed a school of spinner porpoises just outside the French Frigate Shoals reef. There were approximately 30 animals traveling slowly with some aerial behavior. A couple of young animals, in particular, were leaping and spinning. The time was 8:30 AM, and the animals were just off Shark Island. [Maps]

September 13, 1971

Necker Island, Northwestern Hawaiian Islands

During the night it got calmer and calmer until I scarcely knew the ship was moving. The Captain later told me that it had been so calm that he could see star reflections on the sea. The moon lit up the water later and cloud reflections could be seen. Nice for landing on Necker, but it made for a hot hike.

The ship was within sight of Necker when I first went on deck. She is a rugged hogback of an island, roughly in the shape of an L, with Shark Bay tucked inside the L. We landed on the backside of the L, and climbed a very steep defile up the face of the lava cliff, and then wound our way to the first crest (there were, I think, 5 in all, with varying depth saddles between). But to go back a bit.

The motor whaleboats turned out all to be on the fritz so we finally had to load everything in the rubber boat, which worked. The coxswain, 2nd Class Boatswain's mate Smotherman took us in. The swells rose against the steep rock wall of the island at the point we would land, and if one timed it right, you stepped out at the top of the rise onto a level lava shelf. Several things were between each of us and this ideal—slippery algae, uncertain movements of the rubber boat, unexpectedly high waves that flooded the shelf, etc. I followed Gene and John and grabbed handhold and squirmed my way up to dry terrain. Soon everyone had made it safely. We stashed such gear as we wouldn't take—extra water, food, some cans of juice, a radio. Then we gathered our own gear together—in my case chiefly my camera and lenses. Our purpose was to make counts on various of the nesting birds—the boobies, the frigates in particular. I took the blue-faced boobies, and using a little counter made a tally of all the adults and young I could see. There were 185 all told on the island, including about 40 young. The red-footed boobies were about three times as abundant. A count such as this imposes a discipline on your observation and soon I could easily see very striking habitat differences between the two. The red-footed boobies usually nested up on bushes, making little platform nests, while the blue-faced variety used the ground. Red-footed boobies selected a wide variety of terrain including some on rather steep slopes, while the blue-faced birds typically inhabited flats or gentle broad slopes.

The frigates nested in bunches and it was the running of a phalanx of squawking, pecking birds to go through one. They lunged out at one but other than turning on the

nest they did not change position. It became easy to make a judgment of the length a frigate could extend its neck and to get just beyond this. Vocalization seems tied to age. The youngest birds didn't squawk at all, or with less vigor than the slightly older birds.

Our first climb took us up the aforementioned slanting defile in the lava face and we emerged on the crest of one of the peaks, and there found our first marae. It was a roughly rectangular platform, about 30 ft. on a side, with a backwall of stones, with intermittent long ones propped up on end like tombstones. The story is that these are religious shrines of some sort but one wonders if the Hawaiians might not have come to do something mundane like gather eggs, and have camped at these places. Somehow the stones might have been part of a shelter or storage place for eggs. I suppose doubting the conclusions of Emory is some kind of heresy but I get a bit skeptical when anthropologists invoke religious ritual to explain so much. They might be right, however.

From this 200-ft.-high promontory we began to hike the length of the island and this quickly took us down a very steep slope to about 50 ft. above sea level and then up again to our old height. The dips from there on were about half this depth and easier to put up with.

Necker is nearly waterless, though we did see some seeps here and there along the cliff faces, especially down near the water. There is no real watershed so there can't be much.

Five types of plants grow on the island. *Portulaca*, and a legume with compound pinnate leaves that forms low bushes in many places and is widely used by the frigates, *Sesbania*. *Sesuvium portulacastrum* is a plant that looks much like a healthy pickleweed. It is moderately common. Another bush is *Chenopodium* and it is very common. The fifth plant is *Lepturus*, a grass.

The birds at this season are the boobies mentioned before, the gray-backed tern, of which many young were seen, the noddy and sooty terns, wedge-tailed shearwaters, Bulwer's petrels (most come later), and the fairy terns, and the beautiful Necker tern or gray noddy. These little birds have all the mannerisms of the fairy tern, except I did not see them hover in front of your face as the fairy does. They are about the same size and a glossy pearl gray with black eyes and feet. We watched and photographed them for quite a time—the little birds repeatedly landing a few feet from Gene, on a rocky ledge that they seemed to regard as their nest.

Then they fluttered quickly away to glide and swoop over the abyss below like so many toy gliders. What a feeling it must be to have no fear of heights, but to launch fearlessly over a precipice like this.

At the end of the island we came to a lava bubble perched on the very crest of the hill, one side broken out and the floor covered with pebbles. It was a shady spot and most welcome. Gene decided it needed a Guru selling Toyota Coronas. I was happy for it without a guru just for its shade. Gene and Al Sarra went downslope to look at some caves while the rest of us headed back for the landing. It was hot by this time and I was glad when I had inched my way down the steep defile and could engulf a can full of water. Erwin and I enjoyed sitting and watching the birds, the turtles that came up close and other sights while the others went exploring nearby. I lay back on the life jackets and even snoozed briefly. Later, as I learned, part of this was done on Gene's hat. It needs blocking.

On board we upped anchor at 1600 and when we were 10.2 miles ESE of the island, just over the 100 fathom curve, we encountered a school of about 30 spinners. They were shy of the boat, but several spun for us and a couple did head over tail leaps. With them was a monk seal.

The water was absolutely flat calm and I kept watch as long as there was light. We had a glorious sunset with the thunderheads all around lit up by the fading sun in various shades of apricot and rose. Their reflections streaked the sea on all sides of us. I remember such days when I was in the Navy and we travelled close to the equator, but never have I seen it so far north.

Notes, a movie, and to bed.

September 14, 1971

Nihoa Island, Northwestern Hawaiian Islands

Nihoa was in sight when I first reached deck this morning. The weather continues to be flat as a lake and the jutting mass of the island stood gray above the silver water. One of our engines is feeling a bit poorly and so we are now traveling on a single main engine which slows us to about 8 knots. Because of this it wasn't until about 10:30 that we came to anchor in Adams Bay on the south shore of the island. Before dropping the pick we circled the island. It has an almost sheer cliff (in places it actually overhangs) on the north and west, dropping about 900 ft. straight into the deep blue sea. Sea caves line the cliffs in many places. Two of them actually pierce the rock. One, on the east end, goes clear through and you can see daylight through it. The other, down the north shore a ways, is U-shaped. Late in the day, Gene and the skipper and Eric took a rubber raft through it. I'd hate to try it if any kind of sea was running.

As we came in, about a mile off the west end, a lone *Tursiops* made an appearance off our beam, dove and wasn't seen again.

My muscular aches and pains continue so I planned not to follow the others up 910 ft. Miller Peak, but to be a bit more moderate and hike to a grove of *Prichardia* palms. These are endemic fan palms, living only on this little island. The island is slightly less than a mile long, has two major saddles, clothed in green brush, and a series of promontories, of which Miller Peak is the highest. The others are close to it. The palms stand out as darker green groves in the ravines. They mark major areas of seepage. The one I visited choked a water course and must have received rainwater each time it fell, in addition to the ground water I found there.

Our landing, in spite of the calm sea, was a wet one. The rubber raft nosed against a cliff at the edge of a wave-cut terrace and the bowline was held a little tight by the man on shore, causing us to bend grotesquely as the wave dropped. Actually it dropped enough that the man on shore couldn't see what was happening to us. The water cascading off the shelf poured into our jack-knifed boat and I was most grateful I had finally decided to put my camera gear in the rubberized waterproof pack I have for the purpose. It came through nice and dry.

Everything and everybody was offloaded without mishap and we began to assemble for the activities each person wanted. I first spent some time in the fine tidal pools on the shelf.

The wave cut terrace, averaging about 40 ft. wide, was covered with tidal pools, most shallow, but there were some deeper potholes. The opii limpet was very common,

and very large, attesting to the fact that no one walks on these rocks from the main islands. They are such a prize now—something like 18 dollars a quart—that it will soon begin to pay poachers to visit the island to collect. A light-tan branching alga was very common, and the vegetarian high-tidal blenies were also very common. These are the very elongate fellows that one sometimes sees leaping from pool to pool in flight. The flat-spined purple urchin was very common as was a paler-spined species. I was interested in the colors and forms in the pools and spent quite a long time photographing there. The new camera is such a joy in spite of being heavy and in spite of the fact that I had trouble with its mirror later in the day (Nikon F with motor drive). The motor drive frees your hands to photograph—one can concentrate much more thoroughly on his subject that way.

I had to make a trip back to the boat to get a battery for the light meter and by that time the others had set out to climb Miller Peak, which I didn't want to do anyway.

So, I went the other way, toward the nearby canyon where the *Prichardia* palm grove was located. It was a steep rocky defile. One first has to scale a rather steep waterfall area where during rains a stream must cascade into the sea. Then, shortly one comes upon little fan palms, that look for all the world like junior-sized *Washingtonia* palms. Sea birds were everywhere—boobies, gray-backed terns and their chicks, noddy terns and chicks, man-o-war birds, and many Nihoa finches. These are bright lemon-yellow fellows that look very much like the Laysan finch. They are quite tame and flocked around me, landing on rocks a few feet away, fluttering in to seeps from the rocks for a drink, and especially, hopping from branch to banch in the palm groves. There were pools of greenish water in the rocky floor of the defile and from one of these I raised a female pintail duck. Later we found the body of a fairly long dead pintail drake in the same pool. There would seem to be very little for these birds to feed on here, but come they do in a long migration from the mainland.

Just above the main grove of palms, I came upon old stone walls—dikes of rock set adjacent to the stream course, and I imagine used as terraced fields by ancient aborigines. Up on the slopes above were a good many caves, some of whose mouths were partly blocked by carefully placed stones, and these I assume were dwelling places. At the back of some of the supposed fields were the upright stones that Emory says are indications of a shrine, which he calls marae. I don't know. One of the crew found what looked like a stone bowl which we left.

I tasted some of the water and concluded it could be drunk but that it would be better to control the bird population a bit more.

Especially I looked for the miller bird—the endemic little warbler-like, or wren-like bird that lies only here. John Sincock calculates that there are somewhat over 400 of them here.

At the upper grove I found them—sleek little grayish tan birds with a slender black bill. They love the dense bushes and seldom leave their habitat. They will come near to a waiting person but will usually do no more than stick out their heads to peer at you. To get the whole bird in a picture required a lot of patience. John says it can best be accomplished at the seeps where they will fly in and cling to the moss.

Gene, Dave Smith (the skipper), Al Sarra, and John Sincock came over the hill and together we clambered back to the beach and finally made it out to the *Buttonwood*. We were the last people on the island.

On board the Chief had caught an enormous ulua—about 70 lbs. It was heavy enough that it was difficult to lift for a picture.

At dusk the anchor was brought up and we are on our way home. It will take 36 hrs. from here, since the ship is using only one engine. Donuts after dinner and a good movie—*Zig Zag*—a thriller. Movies every night on this ship, and two if they get in the mood.

It's been an adventurous trip for me, seeing new places, and wild ones. It has been a pleasant surprise to find how well most of these important little islands have prospered under protection. The seal population is much increased over its low point some years ago, the birds seem stable, and the habitats, the most important of all, are being protected with considerable zeal by Gene and his men. In fact, I am mightily impressed with the job they do. They know their islands, the fauna, the flora, the history. They extend themselves considerably beyond the role of biologist in carrying out their job. Gene spends quite a lot of time seeing that good relations are maintained with the Navy and with people like our most affable hosts, the Coast Guard. All in all, very fine.

Not only these things but the islands themselves are national treasures and they must be given every attention. Their proposed status as wilderness areas is not only appropriate, but it would be a mockery of the wilderness system to exclude them. They are not clothed with pines and they don't have glaciers or mountain lakes, like most wilderness, but they are unique in the U.S., and they are wilder and more natural than many areas presently in the system.

September 15, 1971

Enroute to Honolulu

Imagine that—we saw our first ship since leaving Midway—a fishing vessel very far away under the Napali cliffs of Kauai.

The weather continues flat calm. Even the swell has dropped until it is essentially nil. In the lee of Kauai it was glassy enough to see the V-wake of a mahimahi's fin.

We traveled all night on one engine, and continue under this power today. We make nearly as much speed with the single engine as with two. The second engine is provided mainly for pulling power, I am told, since the *Buttonwood* is equipped to tow large vessels with a big chock aft.

I spent the day on watch, with a few moments spent packing up my scattered belongings. Amazingly, they seem to fit in the bags I brought.

In spite of the absolutely perfect viewing weather we didn't see a whole lot, and I mostly got windburned for my pains. In the afternoon we had two waterspouts drop down out of a large cloud. One could see the great disturbance on the sea surface and the swirling tube leading into the cloud. The expected remarks about clouds refilling, or draining or whatever were made and photographs were taken. Various folk revealed their not-too-exciting experiences with other water spouts.

Notes, a look at the engine room, and then to bed.

Oh yes—one of the mess cooks came in today with a lizard in his hand—a Laysan Island skink that he had found in his t-shirt. Gives you an idea of how these critters can get transported around the Pacific.

We docked at about 1 AM, a nice landing by the Exec. Steve Yoder, and prepared to debark in the morning. I paid my mess bill—an astonishingly low \$23.05 for the trip, said goodbyes, and so forth. It's been an exciting and wonderful trip in good company.

November 9, 1967

Balboa, Canal Zone

Fred White, Bob Sahara, Dick Rosenblatt, and I boarded a Pan Am plane at Los Angeles and flew to Panama City with one stop at Guatemala City. The flight was uneventful. Clouds obscured the countryside from Mexico to the south for the most part. We disembarked at Guatemala City for a while and found it delightfully cool. Great cloud-capped volcanoes rise up above the rolling rutted valley in which the city sits. As we rose from the humpy airport the aromatic scent of the rainforest was pumped in to us briefly and then was gone. It was night before the plane glided in from the sea at Panama. The city was lighted up like a small version of Los Angeles. We were met at the airport by the agent and the ship's skipper, Mr. R. B. Harnes. We were quickly escorted through and made our way to the *Alpha Helix* which lay alongside a dock adjacent to the canal. She is as white and pretty as ever. We were greeted aboard and assigned to bunks. I bunk with Dick Rosenblatt.

Everyone of the scientific crew is aboard but Eddie Shalenberger—Frank Carey and John Teal from Woods Hole, Malcolm Gordon, Chief Scientist, and Alexi Kuznetsov, a Russian ecologist.

After much palaver we went to bed and will leave tomorrow for a trip around Barro Colorado Island and the Smithsonian Institution's station there.

November 10, 1967

Balboa, Canal Zone

After breakfast most of us hiked down to the railroad station for the ride to Gotun Lake, about $\frac{3}{4}$ of the way across the little country of Panama. This trip is wholly through the Canal Zone, which looks like one big USA military installation in that everything is neat, all architecture is regular and sterile barracks style, trees and bushes are planted in military rows (straight lines or circles) and tend to be in even numbers.

We boarded the Canal Railroad from a neat little station set near a row of great leafy banyans whose aerial roots had been discouraged. We were greeted by a white American conductor who efficiently punched our tickets. We clattered along the canal watching the ships pass by and into locks. The surrounding hills are vegetated with rainforest—a bewildering array of tree types—palms and tall leafy species. Finally we reached the siding of Frijoles and were met at a nearby dock by a launch from the Barro Colorado station. In it we crossed the ship channel toward a large jungle-covered rather mountainous island. We had been warned that ticks and chiggers were surely going to attack us in droves and so slathered ourselves with anti-insect unguents—over shoes, cuffs, legs, and arms. The lake was swirling with black terns—a pretty little species in its winter plumage—black eye and beak, grayish elsewhere.

At the Barro Colorado dock we cast our eyes up an horrendous stairway of at least 300 steps alongside which ran a cable railway for old infirm visitors (we were all young and vigorous). Puffing in the heat and humidity we trudged to the top to be met by the [?] Dr. Robinson and his wife. He was a red-haired paunchy behaviorist from England. He led us into the main mess hall and office, a large rather mouldy building, gave us a beer (his wife did) while we laid out plans for the afternoon. First a tour of the lab, then a hike in the forest. The director graciously showed us everything—library, zoo where several monkey species were kept and a doe-eyed young tapir stood by silently. Later we

learned that she had been attacked by the wild territorial male of the area and had literally been lifted from the ground by him in his teeth and worried in mid air. She bore ugly wounds on her shoulder to prove it all.

The howler monkey at the end of the cage responded to Alexi's coaxing and began howling—a series of pumping howls as his throat grew large and filled with air and finally great resonant bellows. Never, we were told did he reach full volume though.

Around our feet ran, or slithered rather, a Central American otter—he followed our feet up the stairs and chittered at us. He took Malcolm's index finger in his mouth and while he did not bite down wouldn't let go and was gently eased off by the manager.

We moved on to the insect room. Orb weaver spiders were being studied and many had built webs in special cages equipped with wooden discs. All were fed on crickets encased in little silk shrouds. Each silver-backed spider was sucking his dinner from such a captive prey. Then we met the phasmids—stick insects. Some were 12 in. long creatures that looked like large dead twigs. Even in the hand the animal was scarcely visible beneath his camouflage of color, texture, and shape. They were utterly remarkable. One leaf mimic from the far east had hatched out. It was a magnificent example of concealing color and pattern.

Afterward we set off up the David Fairchild trail—up steep slopes slippery with red mud beneath the canopy of the forest. All about were dead leaves of all sizes and shapes, seed pods, some 3 ft. or more long—like great bean pods, lianas, air plants, tiny little lantern-like white mushrooms lined along the margins of rotting logs. Another fungus that we saw from time to time on rotting logs on the forest floor was a perfect cup, bright pink and fringed with white hairs. A good many birds flitted by us—a big trogon with a katydid in his bill, a derby flycatcher holding a moth too big for him to swallow. When he dropped it for an instant, in swooped a squirrel cuckoo and scooped it down. High in the limbs of a bromeliad-encrusted tree, a pair of mannikins sat calling—bright vermillion heads and jet black bodies.

Far off through the leafy jungle we heard the resonant bellow of the howler monkeys. The noise was, at times, on either side of us and sometimes so near we might have seen them but we never did.

John Teal led the way and finally up ahead we heard him call. I trotted up to see him pointing at a magnificent boa 9-10 ft. long, coiled and curved along the trail edge, partially under fallen leaves. He was nearly invisible and wholly immobile. The blue opalescence of his back scales shone in the mottled sunlight that struck down on him through the canopy above. He could not be disturbed but lay silent flicking his blue tongue in and out. After some prodding he “sidewound” (believe it or not) away through the undergrowth. We could see a depression where he had been lying, indicating that he had been there some time and probably had scooped out a place for himself.

Shortly afterward we turned back, stopped at the station for a beer (25 cents), hiked down the stairs, and boarded the boat.

Back on board Alexi the Russian gave us a Russian vodka party. He plunked two bottles of vodka down, opened up two cans of caviar, one black sturgeon, and the other red salmon. I liked the latter best, in fact it was delicious. The drinking consisted of pouring about 1 ½ in. of vodka in a glass, saying a long toast, and downing it in one gulp. It sure left a warm place in your stomach and after four toasts Malcolm was really getting gay. Alexi is a raw-boned, determined, crew cut fellow obviously full of party

spirit and definitely an organization man. He believes in team research and thinks little about the extreme intellectual independence our scientists show. There are routes for flexibility in his system but they are hard and the weaker spirits all conform.

Warm and cheerful we went to bed.

November 11, 1967

Balboa, Canal Zone

At 8:00 A.M. Dick and I left for the Smithsonian Marine lab for a fish collecting trip. We drove out on a cansway to an old World War II bunker that has been converted into a passable lab. Adjacent is an old cable storage shed in which the station is converting a series of large cement tanks for marine work. It will be a splendid facility when done.

We were met by Bob Tapp and wife who accompanied us. Bob is a grad student at Harvard working for his Ph.D. He likes fishing and his wife likes fishing and I think that is why they study fish. Ultimately I was not impressed that they are apt to learn a great deal.

The poisoning netted a variety of fishes not greatly different from the assemblage I remember from the Gulf of California.

While the poisoning was being laid out I swam around with face plate and looked at the underwater scene. At least three damselfish were in evidence—*Pomacentrus acapulcensis*, *P. flavilatus*, and *Microspathodon*. Several wrasses, including the pretty violet and yellow *Thalassonia lucasensis* (one of the sex-changing types). Two butterfly fish, a small grouper (*Epinephelus labifonius*), a sergeant major, smooth puffers, and others cruised by. On the rocks just below tide line the surface was covered with a big rounded barnacle and a very rough-ridged limpet—like a much oversized *Acmaea scabra*.

I hauled out on a lava shelf and rested in the sun, watching the passing scene. A big old *Tursiops* cruised by out over about 150 ft. of water, breathed a few times, threw his flukes and disappeared for a minute or two, presumably feeding on the bottom. Pelicans flapped and fluttered in the top of a nearby forest tree overhanging the sea from a steep rocky islet.

Shortly we turned back in and soon were back at the *Alpha Helix* where I spent the afternoon [?] my lab space. Dick Rosenblatt and I share the wet lab—a nice space adjacent to the afterdeck. Tomorrow we sail.

November 12, 1967

At sea, enroute between Panama and Galapagos Islands

The ship cast off moorings at dawn and soon we began crossing the Bay of Panama going nearly straight south in order to round Punta Mala, which bounds the west limb of the bay. Out in the bay we saw several groups of porpoises, mostly *Stenella graffmani*, I believe, except for one group of *Tursiops* that swam in toward our bow. Tony, a crewmember and a long-time tuna fisherman, said *S. graffmani* was the “spotter” of the tuna fisherman and that *T. truncatus* was the “black porpoise” that fish did not follow. A flock of brown boobies amused us by diving in front of the ship as we cruised along through the calm water. They dart into the water like arrows. When the angle of their flight became low enough we saw them bounce off the surface.

One young bird spotted a fish just ahead of the bow of the onrushing ship, flashed past our heads in a screaming dive inches ahead of the ship's stern, and plunged into the water just ahead of the tow wave. He was royally tumbled an instant later as the wave caught him—but never fear he tried again later on with similar results. The day was overcast and cool but only after we had cleared Pt. Mala did the calm disappear and a chop and swell build up.

Several birds more or less new to me were common—little flitting storm petrels, like daytime bats, cruised low over the waves, and were to be a constant accompaniment all the way to the Galapagos. Sabine gulls, likewise pelagic birds, were often encountered as were the larger blue-faced boobies.

Before the day was out the *Helix* was pitching mightily under scowling clouds and rain with winds of about 15-20 knots. Eddie and I stood porpoise watch and once the shore was left behind sightings became slim indeed; another feature that held true all the way to the Galapagos, in fact the open sea seemed wholly vacant of such species as *Tursiops* and one wonders how they have come to colonize most oceanic island shores. Certainly crossings of open sea must be rare for such species.

Islands probably collect pelagic animals, both because the sea floor rises and makes deep water food more available and because they simply lie athwart paths of movement. As witness to this, true oceanic species are much more common as strandings on oceanic islands such as Hawaii or the Galapagos than they are along continental shorelines like Southern California.

November 13, 1967

Enroute Galapagos Islands

More of the same—rougher even and nearly everyone seasick to some degree. I am affected much more by the ponderous predictable roll and pitch of the *Helix* than by any smaller boat. It took some fortitude to stand watch, particularly when there was so little to see—wind-whipped seas and swells, spume flashing over the bow and foredecks. We already await anxiously our arrival at the Galapagos.

Malcolm and I slept in the lounge where we could stretch out athwartship to avoid the jarring pitch as the *Helix* plunges into the sea.

November 14, 1967

Enroute Galapagos Islands

Things have calmed somewhat but most of us feel only half alive under the influence of Marizan [?]. Skies are dull gray or rainy. We saw one porpoise school in this endless sea—lonely indeed surrounded by untold miles without others. It makes schooling behavior, aggregation calls and even the possibility of mimicry in calls serving to identify a school more meaningful.

About five species of flying fish have rushed from our bow—a dull reddish-winged form, one with banded yellow and black wings, one at least with ventral and pectoral fins about the same size, a bumble bee-like fish, and one with black wings. I saw two fold their wings just before diving back into the sea.

This far out to sea—perhaps 400 miles or so, we see man o' war birds soaring overhead, and they can't settle on the water.

November 15, 1967

Galapagos Islands, Ecuador

Seas have calmed greatly and still we see no porpoises. By about 9:00 A.M. the sea was nearly flat and we found ourselves with San Cristobal Island (Chatham Island) on the radarscope. A heavy storm, however, obscured our view. Finally, the island emerged from the clouds—as austere and barren as the Kan desert of Hawaii—a volcanic landscape of cones, cinder fields, and one tall cone protruding into the cloud blanket. The sea fell flat calm sliced here and there by tide rips of agitated water. Sea lions began to appear, sometimes leaping porpoise-like one after the other. The Galapagos albatross, a relative of the great linpan albatross, was seen and many frigates and Galapagos gulls came to our masthead. Not a porpoise was seen. Finally we rounded an offshore rock and entered the unprepossessing harbor of Wreck Bay, which is lined by little Ecuadorian villages of Baquerizo Moreno, the site of the Ecuadorian port authorities and navy.

Malcolm went ashore with all our passports and a pair of Ecuadorian navy officers, one a very stern unsmiling Lt. Commander (at least he had gold oak leaves on his shoulders). When he returned some hours later he was accompanied by an armed guard, a pleasant young fellow named Olayo.

Fishing on the fan tail has stopped. Dinner is over and we make way for a new anchorage.

Actually the ship hauled anchor and we made our way toward Academy Bay some 45 miles away. We will cruise very slowly tonight and arrive tomorrow morning at dawn. After an unsuccessful stop to do some night lighting we hit the old pad.

November 16, 1967

Enroute, Lagus Cove

Up near dawn to find us about to drop anchor in Academy Bay. Lava floes had poured into the sea from the peak of Santa Cruz Island (Indefatigable) above, forming a rough cove bounded by 20-30 ft. lava bluffs. The entire shore is fringed with palo blanco trees and the arbousant platy opuntia—a cactus tree standing 20-25 ft. high. The village of 1,500 souls lined the bluff and back bay. We cruised in the skiff and landed alongside a series of cement steps on the lava.

Once up on this platform the village lay beyond—clusters of houses with rather ill-defined streets meandering between low lava rock walls. Most houses were on stilts with chickens, pigs, and goats beneath. Most had horses or burros in rock compounds. Some remarkable Galapagos dogs wandered the streets and much like Hawaiian poi dogs. Several stores advertising supplies, Ron superior, aguardiente, or various oil products lined the street. We walked along toward the Darwin Station which is reached along a 1/3 mile footpath through the dense shore-edge vegetation so tangled and thorny that one could not walk through it. Darwin's finches were everywhere and in bewildering array. Beak types and color patterns seemed to run the gamut, and to be all mixed up. The warbler finch and the cross-billed variety ate bananas alongside the cactus finch. Lava lizards (*Tropidurus*) were everywhere, very tame and in bewildering array of patterns and colors ranging from striped ones to more or less uncolored ones with reddish throats to grossly patterned individuals. One literally worried about stepping on them. I found that

I could bring my hand within about 6 in. of them before they scurried off. They were, however, wary of being touched.

Finally we reached the station which is a cluster of low white buildings set in the sand at the edge of the calm cove. There is a nice neat lab with collections, some library, a little set of display cases, and offices. The Director, Dr. Perry, is a paleontologist turned BBC commentator who does some work on the high-altitude composite tree *Scalesia*. He is an efficient administrator from all appearances who keeps a clean, well-running lab. I looked through his cetacean literature and found a bad paper listing some Galapagos cetaceans--*Extrait de Mammalia*, 55 Rue de Buffon, Paris University. Notes sur quatre cetaceas de l'Océan Pacifique. Tome 27 No. 4, Dec. 1963, and *Lista systematica de Maníferos del Ecuador* by Prof. Gustavo Orces, Escuela Politécnica Nacional, Quito. The latter looks like an honest attempt at listing the cetaceans. We then went on a tour of the lab and met a Scotch scientist working on human diurnal rhythms—she had been to the Arctic working with the Eskimos and now was here on the Equator. An old bandy-legged (?) blue-eyed Norwegian took us on a tour of the turtle species. They have built big lava rock-walled compounds in which four species of tortoises are kept. They are fed cactus and fruits, and seem to do very well. A heavy growth of tree cactus (*Opuntia echinos*) and a large tree cactus plus palo blanco trees and various shrubs grow in each pen and provide shade. The Hood Island species, which is nearly extinct is represented by a pair—they are rangy, fast-moving beasts with very long legs, necks, and a great arched shell. No egg laying had yet occurred but they were hopeful. One pen was full of young of Pinzon Island forms and another of Santa Cruz young. They were all doing well and would soon be invulnerable to pigs and rats, their worst enemies when young.

A grand old land iguana (*Corolophus*) crawled toward his crevice in the lava and eyed us with his skeptical red eye before retreating below. They are excessively rare now and most colonies number 10-20 animals only. We will visit one colony on Fernandina Island.

We wandered back to town looking at mockingbirds and finches and watching the latter hopping into houses and stores, seemingly oblivious to people. Finally, after a beer in a most idyllic "club" along the footpath (a lava house with coral paths, cactus, bouganvillea, and other flowering plants, swings, a cool shaded veranda, and a nice lady to serve us—50 cents for a huge Ecuadorian beer).

Finally our boat came in between two dugouts supported by balsa logs loading goats, and we returned to the *Alpha Helix*, which lay riding at anchor far out in the bay. On board we found that officialdom held us up pending authority to take marine iguanas. Finally it arrived and we hoisted anchor and set out into the calm sea toward Isla Isabela to the west.

To the south lay Santa Maria, a jumbled mass of volcanic peaks, to the northwest Pizzou and ahead Isla Tortuga, a nearly drowned volcano whose rim only lay above the surface as a steep, arcuate ridge. Behind the massive Isabela rose into the clouds. Across the glittering calm sea we cruised and for the first time saw porpoises and whales. A medium-sized whale (probably *Balaenoptera acutoarostrata*), perhaps 30 ft. long, cruised by us on one side and soon we crossed a school of perhaps 200 bottlenose porpoises. As many as 20 rode our bow at once including mothers and young. Later I listened to them squeak and click on the echo sounder as they played at the bow.

Darkness settled and a full moon rose as we secured our watch for the evening. Tomorrow, our destination.

November 17, 1967

Tagus Cove, Isabela Island, Galapagos Island

With the graying of dawn I poked my head out of the window (we have windows) and saw the great rounded bulk of Fernandina Island off three or four miles to starboard. The sun shone on it in patches, illuminating the fissured flows of its new lava slopes. Three cloudbanks circled it, one obscuring the peak which rises nearly 5,000 ft. above the sea. All except a thin fringe of green mangroves at its shore appears barren—cinder slopes, [?]. The slopes are clothed with a straggly growth of palo blanco trees and lower scrub—nothing like the density found at Academy Bay. Cool water (21 deg. C.) ameliorates the tropical clime and the air is cool, even chilly, certainly strikingly unlike tropical areas I have known elsewhere.

Eddie and I prepared our gear for the sound transmission test—a modified skiff—and all systems are operative.

Finally at 4:00 PM we set off to try for a porpoise. Tony took the wheel of the runabout (a 60 HP motor-fiberglass hull) and off we went—literally. He has no idea that there are intermediate speeds between stop and flat out—wow, my aching back!! We skipped from wavetop to wavetop at about 30 knots—one could hardly stand up and certainly couldn't sit down. With a rush of whitewater flipping lagging petrels who didn't rise fast enough we rounded the point and out into the channel. After some miles of this a school of about 100 porpoises was sighted leaping as they rushed along. We raced up upon them and as they lept I could see that they were the common dolphin (*Delphinus* sp.). They had the typical saddle, light belly, dark eye ring, and beak—only their beak appeared short to me, by California *Delphinus* standards. Several times we were able to race into the midst of the frightened school before they could turn away. Graceful leaping porpoises were on all sides of us. It was impossible however to shoot from the bucking boat when the only thought was of self preservation.

Later, as we turned back toward the ship, Punta Espinosa, where we will make shore camp, is a finger of jagged lava protruding out into the calm waters of the channel between Fernandina and Isabela.

The calm channel was dotted with swirling masses of petrels, man o' war birds circled and darted overhead, straggling strings of little white phalaropes flowed inches over the sea. The beautiful dusky gray-headed Galapagos gull fluttered down and stood on the rail—its somber colors set off by a red eye ring and bill.

Everywhere were sea lions, porpoises, rising up as they swam to eye us curiously and dive again.

The *Helix* rounded the edge of a layered cinder cone whose slopes dropped precipitously into calm black water and entered Tigres Cove, which occupies the flooded caldera. All along the bluffs are the names of vessels and the date they visited, painted in white paint on the ash beds. Some are said to date back to whaling days when this was a favorite anchorage for sperm whalers. Once at anchor, deep in the totally sheltered cove, there was time to look at the nearby island a bit more. The rocks are splotched with red crabs (*Grapsus grapsus*) and marine iguanas are common everywhere on the rocks above

tide line, spreadleg in the sun. Quite a few Galapagos penguins were noted standing just above water line on the sloping rocks.

Spouts were sighted again—broad, mushy, vertical ones. Often enough the spouting animal showed none of its body but finally I got a view and could see the little hooked dorsal far aft. Then we came in close once and when within about 30 yards watched a 30 ft. animal rise, swell its head, and blow from two nostrils that surmounted the swelling—a pygmy finback whale ([later note] probably Bryde's whale), without a doubt—a creature that I had been surprised to find as far south as Los Angeles in California—and here on the equator! One wonders if it represents the warm-water end of a breeding migration—perhaps from the south along the cool Peru Current. Obviously at least most of the spouts we have been seeing are of this animal

While far out in Banks Bay we saw Carl Angermeyer's sailboat working its way down. He has lived in the islands since 1937 and built this boat himself, much of it from native Galapagos materials—the ribs and frame, the nails from copper wire cut and pounded into nails, and so forth. Later, back at the ship, he pulled alongside and came aboard—a tall, reflective man with a curiously sweet if gnarled face, huge, tough hands, and a taciturnity made all the more intense by his sweet talkative wife. Forever pulling on a pipe he uttered little unless asked but then was revealed to be a good observer of his limited world as was his wife. Both are about 50 and very hale and hearty. Fred White will live on their vessel while he works at Punta Espinosa. Mention was made of my desire to obtain 2-3 *Tursiops* and Angermeyer clouded over and talk shortly revealed that he felt kinship as their schools swooped in toward his little craft and played in his wake or bow wave. I acutely began to feel an awful intruder, and the wall that rose between us. What need of men could make them want these animals enough to kill them he seemed to but did not say. To his wife it was enough that they would be “prepared” for a museum. To Angermeyer, not so. I feel my own presumption enough when alone in this task of killing porpoises but in Angermeyer's presence it might be more than I could bear—quite aside from his feelings in the matter. Such a curious tangle of emotions and motives. I hate what I am doing in part, yet press ahead with anticipation with another part. Why anticipation? I suppose it is because ahead lies some curiosity for how porpoises hear and phonate and a greater fragment of desire to document my bright novel idea for my fellows. These things override my long and sometimes personal association and attachment for individual porpoises and the tribe in general. They even sought to override the will and wishes of a sensitive reclusive man of whose world these animals are a real and important part, even to the extent that he might become an instrument of my wholly foreign wishes. What needs does he have, the sufficient man whose hands could fashion a perfect boat, that should compel him to take such a subservient and venal part of my own semi-mad motives? At any rate it seems improbably that I will do more than record from the good ship *Nixie*.

The Angermeyers told stories of a neighbor at Academy Bay building a house on the lava bluff above the tide line that was the home of a dozen marine iguanas. The iguanas moved in when the house was done, climbed the roof, and are still there. The owner, a Norwegian, lets them in the house but because they leave feces around periodically rebels and locks them out. Apparently they circle the house until let in.

Off to bed.

November 18, 1967

Drifting in Banks Bay, Galapagos Islands

Early this morning I heard a lot of bustling and stirring on deck. Emerging I found Fred White piling up his equipment preparatory to loading it on Angermeyer's little sloop. After some palaver Angermeyer decided not to load in Tagus but instead at Pt. Espinosa so off he went, sailing finely out into the Bolivar Channel. Finally, we followed along. My quandary about where to collect remained so after some hemming and hawing on my part I broached the subject of collection from the *Helix* with Captian Haines. The propellor cannot be stopped inside of 6-10 seconds—far too long to avoid a line pulled by a diving porpoise, but the Captain seemed not especially worried—there are ice deflectors—thin plates of metal ahead of the screw—that should sweep the rope by. So, the *Helix* it is and Eddie and I forthwith began to rig lines and buoys. After landing Fred and his gear (he will work ashore at Punta Espinosa) we began searching for porpoises—first across [?] Bay toward Cape Berkeley—heading our ship in toward an enormous semicollapsed volcanic cove broken into a sheer wall that plunges into the sea leaving behind a little cinder cone that was once deep in the crater. Finally two miles at sea from its towering slopes we came upon about 80-plus sleek porpoises—Tony calls them white bellies—I think they are *Delphinus* but they could be *Stenella*. It was obviously the school we harried yesterday. From the first they were wary and as we pursued them they grew more and more frightened and refused to come near us. Several times we cut the school in two and always they would veer away and race together again frantically, sometimes in so doing they passed us in a driving leaping rain of porpoises, rank on rank in the air in beautiful arced leaps, their glistening sides flashing in the sun. I saw amongst them babies swimming as fast as the rest and three individuals with a triangular white spot on their dorsal fin. Finally, after I had taken enough photographs to be sure of identification we left then and turned in toward Isabela Island. Shortly we encountered three large whales blowing tall columnar spouts. They seemed to be (still *B. edeni*) small finback whales—we paced off the length of one relative to our ship—35 ft. They were in 600 fathoms over a scattering area at 150 fathoms (on the fathometer). After quite a lot of observation and photographs we turned toward Bolivar Passage and Tapus Cove. No porpoises. Through the passage we went—through groups of seals and many birds but no porpoises. Just above Pt. Mangle we turned back to Pt. Espinosa, picked up Dick Rosenblatt and his fish, John Teal, and Frank Cary and cruised on out to the sea end of Fernandina Island.

Returning inshore I ceased my watch at sunset and Malcolm took over dipnetting in 900 fathoms while the boat drifted. Tomorrow we cruise Elisabeth Bay.

November 19, 1967

Adrift, Banks Bay, Galapagos Island

Up anchor early and after *Tursiops*. Down Bolivar Channel to Elisabeth Bay. The effect of cool water on climate here is amazing. I have to wear a jacket and often shiver at that because I failed to bring a warm enough one. It has been overcast however and when the sun comes out it beats down in good force. Twice today we pursued groups of about 10 bottlenose porpoises but never would they run our bow for more than a moment. Our traverse took us many miles, most over flat calm seas. Through Bolivar Channel, along under the bulk of a great truncated cone on Isabela Island, rising perhaps

4,000 ft. in one sweeping lava slope, thence to the Istmo Perry, a low causeway that crosses Isabela Island but is so densely vegetated it cannot be crossed on foot save with a machete and a week's work. Then we cruised along under the bluff of another and still another great dome as we worked along to Webb Cove at the extreme western point of Isabela, thence across wind chop to the south shores of Fernandina, the most majestic cone of all (and the newest), back up Bolivar and clear across and back across Bank's Bay by nightfall. Eddie and I kept watch all the way, watching every suspicious white cap with binoculars. It was tedious and we did not succeed, still we learned a lot.

In the deeper parts of both Elisabeth and Banks Bays the big whales were common. I suppose we saw about 10 in Elisabeth and 4 in Banks. The disparity only means that much more time was spent in Elisabeth than Banks. As I have never been able to see the asymmetrical color of the lips and because of the latitude I now think it likely that they are Bryde's or Sei whales, much more probably the former. Several times today we had them very near us and I believe I remember the typical ridged head of the Bryde's whale (*B. edeni*). We shall see. In Bank's Bay the big porpoise schools came in view again and my confusion grows. This time I could clearly see the black line running foreward on the belly from the vertical surface of the tail stock (see data sheets) and do not think it could be *Delphinus* but must instead be some species of *Stenella* that I cannot identify.

Twice today broadbill swordfish cruised up to us—shining bright blue in the water. You can always tell a broadbill from a marlin because both his dorsal and caudal fins stick out while only the caudal of a marlin shows, waving back and forth.

I must comment on the fishing of the Galapagos booby. These birds cruise high—sometimes 200 ft. or so and can be seen rocketing down in incredible dives from that height—like arrows they go—nearly vertically with wings nearly folded to plunge into the water for several feet. The green semiopacity of this water must make it difficult for them to see far down, but no matter. I saw one trimming himself during a near vertical dive, turning round and round like a rifle bullet. Getting the fish is the thing—angle of dive means little. Sometimes it is so low that they pierce waves and pop out the other side and I have seen them skip like rocks on the surface. Tomorrow Ed and I go ashore at Pt. Espinosa

November 20, 1967

At anchor, Punta Espinosa, Fernandina Island, Galapagos

While I was putting my dishes in the galley after breakfast I heard the call “porpoise”. We were just underway to drop a group of us off at Punta Espinosa and had no more than cleared Tagus Cove. I looked out the port hole and sure enough—a big splashing school of *Tursiops*. I raced on deck to find Eddie already rigging the harpoon. A few minutes later and he fired a perfect shot. The animal sank, apparently dead, but the line came away free. The harpoon becket had broken and the line came away. I scarcely thought they would run the bow again, but they did. Apparently the first animal had not alarmed the school. The second shot was not nearly as good and after a short fight with me and Tony in the skiff we brought the animal in—a 320 kg. male that looks for all the world like our California form. Ed and I set to work with the sound transmission experiment. We filled the boat, rigged electronic gear, made up blubber transmission equipment, and went to work on actual measurements. The animal was

photographed, measured, and dissected. Ears and eyes were removed, for electron microscope studies and pigment analysis by Ken Bloome and Bill McFarland.

The test dragged on and on fraught with experimental problems. I'm still not sure what was the problem though I know we need more room to work in, depth-wise. We did complete a fine series of tests on the refractive properties of blubber and blubber-muscle combinations. This took until about midnight, when we both decided we had had enough and called it a day. I stayed behind and washed down and hit the sack about 1:00 A.M. Tomorrow we go ashore to get Eddie set up, and for me to look at *Tropidurus*.

November 21, 1967

At anchor, Punta Espinosa, Fernandina Island, Galapagos

After a lot of preliminary fiddling around, like removing retinas for Bill McFarland, we loaded gear in the whaler and headed for the nearby shore. The way in is a bit tortuous—winding through lava outcrops lying just below the surface. Fortunately, the sea was calm and the traverse was made easily to a landing on some smooth lava just seaward of a dense mangrove forest. We were greeted ashore by a great blue heron who looked us over, stalking slowly back and forth in their peculiar slow, loping gait. I of course thought he would fly, but not a bit of it. True to advance publicity he looked us calmly in the eyes and walked away with considerable dignity. This and other advanced billing should have prepared us for the place but it did not. I came enthused to see the shore life and left feeling I had one of those rare experiences that a naturalist has a few times in a life of seeking them. The richness, tameness and curiosity of the animals had great impact.

Eddie, Olayo the Ecuadorian guard, and I staggered up around the main mangrove patch with our gear until we were above high tide. Eddie and I started off on a sightseeing trip, Olayo having seen it all his life. We were immediately faced with a group of sea lions (*Zalophus californianus wahlbeckii*) sleeping in the cool sand under a low growth of mangroves. They took little notice of us. Even when we stood on the banks of a big jade tidepool the seals continued to race back and forth and gambol at our feet. To be sure many of them would move away when we came within perhaps 15-20 ft., but how vastly different from the California form that begins to move anxiously for water 200 yards away. These sea lions are very small—perhaps ½ the size of comparable ages of the California form. The bulls bark, but it is a rusty, rather soft bark.

Ed and I worked our way out toward the main point. Every rocky promontory had its compliment of bright orange grapsid crabs (*Grapsus grapsus*). There is every gradation from a rather drab maroon small crab to the gaudy adults. The largest had a light-blue patch along the face of the shell below the chelipeds, and the chelipeds are brilliant scarlet. They too are tame, whatever that word may mean. They scuttled out of our way from wholly exposed positions into inadequate crevices when we trod a few feet away.

Their color against the somber gray of the lava is striking. Marine iguanas are everywhere, in the mangroves, and even up in them 15 ft. off the ground (so are the crabs), on the sand, and especially on the lava promontories where great herds bask, bicker, and thermoregulate. These herds are dense packs of animals, some sitting on one-another, with larger, gaudier, adult males interspersed, bobbing in a peculiar limber-necked bob that jiggles their ample jowels by the rebound.

In one such herd at the very tip of Pt. Espinosa, we estimated between 400 and 600 animals (each weighing a couple of pounds). Walking through such a herd was quite an experience—iguanas slithered away in front of one and then stopped a few feet away. Looking back one could see a wake where he had pushed aside the herd—about as wide as a driveway. This, Eddie tells me is about the treatment sea lions get when they enter a herd.

It's rather nice to get the same treatment a sea lion gets from the other wild life. Males bob at one another and seemingly in special areas and often come to physical combat, which consists of biting the neck, and butting. There is much thrashing about and then the quarrel seems settled. Females are nipped by males when they deign to wander through near an agitated male. Fred White feels that this is herding behavior by means of which the male keeps females near him. However, I'm not so sure. Quite enough big colorful males were present without females nearby. Besides the driving seemed as often as not to drive the female away altogether, but this remains to be tested more thoroughly.

Ed tossed a couple of baskers into the water, as Darwin had done more than 100 years before. The lizards still act the same. They race for shore in a panic and climb the nearest rock. It's as if you were dumped summarily into a pool full of cold water—all frantic thrashing.

We continued out the rocky peninsula, wandering among friendly sea lions. In one pool we found about 10 sea lions racing back and forth at full tilt in the shallow water. At first I thought we had frightened them and they were racing for sea, but once they reached the exit they turned and raced back into the deepest recess of the pool, only to start another race that humped up a long wake of water over their path. They were obviously enjoying themselves and we were no more than incidental visitors standing on the bank to cheer them on—perhaps not even paying cutomers. Then we chanced upon a green heron, a wary little bird in the United States. I crept toward him, photographing as I went. Then, when he did not fly as I wished, I sent Eddie on to shoo him into the air. All that emerged is a movie of a green heron mincing along with Eddie close behind. Until we nearly forced him into the water he refused to fly. Later I followed one that walked perhaps 30 ft. in front of me, for 75 yards. Finally I stopped and the bird quickly began fishing. He sequestered himself in a lava crevice at the edge of the pool and peered intently everytime the water rose and washed past his feet. His immobile stance and great patience finally overcame my inadequate attention span and I left.

Around the still racing sea lions we went to the outermost promontory of Punta Espinosa, a large hummock of lava some 40 ft. out of the boiling surf. The rock was literally plastered with wall-to-wall iguanas. I estimated 600 animals. They occupied the rock from waterline to the highest pinnacle of lava. In the overcast of the day they were oriented every which way, but when the sun comes out nearly all swing around within minutes and face the sun.

Here we encountered our first flightless cormorant. He is a perfectly normal-looking bird until he decided to spread his mighty wings for drying in the sun. One did this a few yards from us. The tiny wings are stocked with a scrubby array of flight feathers arranged so far apart it is difficult to see what function they might serve or why it is useful for these cormorants to dry them. The cormorants, too, are tame. While photographing one I managed to cause him to jump into a nearby pool full of seals. He

regretted his action soon enough as they raced around him nudging and nipping playfully at him. He emerged on the opposite bank, dignity reasonably intact, shaking his feathers.

All around the rocks, below tide line as well as above it were many of the little iguanid *Tropidurus*. Nearly all had evidence of salt excretion from the nostrils in the form of a white ring, or even little hillocks around each naris. I saw one lizard wipe the salt away by rubbing his nose on a rock.

We returned to camp and I left Eddie in the midst of preparing to test some of these escape distances in the various animals we had seen. I wandered on down the shore, through a series of sandy coves and rocky points. In some places the lava had fissured deeply as it poured into the sea and one could find seawater leads far back of the shore, sometimes deep down in crevices. It was startling to look into these deep recesses and see the red crabs clinging to the rocky walls, anemones open in the still water and a variety of marine fish lazily swimming back and forth. In one place a lava bubble had burst forming a sizeable pool, some 40 yards long by half that width. In the center of the jade green water was a dense ball of fish, tightly aggregated just below the surface—the Galapagos opaleye (*Girella fremenvillei*). They scattered as I approached—the fish to do not react like the land animals, nor do the penguins and cormorants act so fearless in the water.

From time to time mangrove patches confronted me, acting as rather effective barriers to progress. Their buttressed roots, and nubbly seas of pneumatophores coming up from the sand combine to make progress very difficult. It is usually much easier to walk around them in the shallow water. In one such grove I came upon two mother sea lions lying in the deep shade on the sandy berm beneath the trees. Each had a little baby sea lion nursing. Mother snoozed peacefully as the little one sucked from one of four nipples. The little ones have a peculiar strident cry or bark that only they make, very different from either the bull's call or the voice of the mother. Some of the babies were tiny indeed, weighing no more than 4-5 pounds. One mother woke with a start, scrouffed in anxiety, and crawled away deeper in the mangroves with her baby—perhaps 20 yards.

I was tired from the long experiment of the night before and lay down under some mangroves in the cool sand for a snooze. It proved a somewhat inauspicious bed as it was obviously a sea lion rookery by the smell which became more intense the closer I got. But tired as I was the smell didn't win out, but the flies eventually did, so I arose and walked on.

I came to another deep and beautiful cove. At the back John Teal and Fred Carey were busy trying to find out what happens to a marine iguana's respiration when it dives. They had a hapless beast strapped to a board with a lot of leads running out its mouth. I'm told the animal swam away unconcernedly after the test was over.

Out in the bay we noted the fin tips to a manta that had entered the shallow water. It swam to within perhaps 80 yards of us, with its wing tips sculling the air as it nosed into the corners and crannies of the bay. A pelican stirred on the bank and flapped into the air—they too are not tame by Galapagos standards.

I took the upland route back, behind the mangroves, and encountered many more leads into the lava-filled with seawater. Even a few marine iguanas could be found perched on the rocks, 100 yards from the shore.

Working my way back down to the beach I wandered out onto a rocky shelf where the surf was breaking. Iguanas dotted its surface. As a swell broke on the shore,

white water rushed over these animals. When it dropped they were still in place, as were the grapsid crabs. Later Eddie tried to pull a marine iguana from a rock on dry land and found that their grip is well nigh unto incredible once they have latched onto the surface with their long claws. He literally could not pull one loose, even though he thought he would break its tail loose (these beasts do not autotomise their tails).

Several iguanas were noted feeding, or even simply resting in the still water of tidal pools. The feeders crawled along the bottom, scraping algae from the rocks with their lateral teeth. They were able to crop it down very close to the rock surface. I saw two animals doing the same thing on intertidal rocks in air.

Hot and tired I emerged onto a big rocky swell at the water's edge adjacent to camp. There in the crevice at the crest I found a nursery for little marine iguanas. These animals are conspicuous by their general absence from the main rookery grounds. Here in this deep crevice they clung to the walls in numbers, often on top of one another. They are more fearful than adults too, and it is likely that they are subject to predation not experienced by the adults. This, I think, is also true of the chuckwallas of the Gulf of California islands. There the young are very wary while the adults are the pinnacle of stupidity and docility.

At last I noticed some penguins. Three rollicked in the water just at the base of the lava bluff. They weren't all friendship to each other though—nipping and quarreling. They bray like little donkeys and John Teal reports stepping on loose lava some distance from shore to be started by a groaning bray from underneath, which turned out to be a nesting penguin.

Ed and Olayo were already eating lunch when I dragged up the sandy beach. I was hot and tired and hungry. Our lunch of crackers, cheese, water, smoked oysters, and pieces of leftover steak was fit for kings. Rather shortly thereafter we returned to the boat sunburned and tired but filled with impressions of this somehow unreal world where humans are just another funny-looking upright seal to most animals.

November 22, 1967

This morning I am to go out on the *Nixie* in an attempt to record from the Bryde's whale, if indeed that is the species we have here. So, after breakfast I gathered up all the complicated wires and equipment that go with recording whale voices. It isn't easy for an electronic neophyte like myself. The *Nixie* is anchored far back in a lava inlet. The water is jade, the bottom white sand, and the shore an incredibly jagged mass of tortured lava, much too rough for a person to do more than crawl over with gloved hands.

The *Nixie* is a monument to this gentle man, Fritz Angemeyer, as I was to learn in more detail during the cruise. He designed it, scrounged pieces and parts from everywhere on the islands. The copper wire he used for nails came from the Navy base, now abandoned. The mast came from the sunken tuna clipper *Glory of the Sea*, that ran aground on the north end of Isabela Island, and various pieces of chain obviously came from other wrecks. Most are different styles, shapes, and degrees of corrosion. The keel Fritz cut out himself from a large matesarno tree far up on the slopes of Santa Cruz Island. This wood is fine-grained, and short of 100 years underwater, Fritz tells me, will not rot. In water its beautiful red grain comes up—in the sun and air it turns silvery. The tree seldom yields up pieces more than 20 ft. in length, but Fritz found a big one for his keel and shoe and stem post. Elsewhere he has used it to make bits and blocks and cleats.

Lovely stuff. He put three tons of cement, iron, and lead in the keel, built her beamy, installed a little 8-horse Saab diesel that pushes her at 6 kots. What a jewel, and what a lot of care went into her, not to mention sheer labor. The mast, for instance, he squared with a saw and adzed and sanded to its present dimensions from one twice the diameter. No two pieces of rope are the same—some blue and white polypropylene, manila, nylon, etc.

We put-putted out of the little nook in the lava and up along the shore of Fernandina. Rather shortly Carmine (his wife) spotted a whale. She, it turns out, is a thoroughly excellent observer and a well-read person of many capabilities. We came upon the animal shortly and by that time I had figured out which wire went where on my gear. We lowered the hydrophone in the water with the animal very close aboard. I at once heard some peculiar low-frequency plup-plup sounds repeated at reasonably regular intervals. These I successfully recorded. The big beast (about 40 ft. long) was cruising in more than 600 fathoms of water I guess from the chart, and it seems doubtful . . . [?]

On out across the bay we cut and rather shortly sighted a school of our little *Delphinus*-like porpoises, racing at full throttle across the bay, leaping in waves out of the water. No amount of pursuit brought us much nearer than 500 yards. After an hour or so we gave up the chase and proceeded across the bay. Lunch was brought out—very tasty potato salad, rye bread (baked by the Mrs.), and delicious Ecuadorian orange marmalade, plus lemonade. Two more whales were seen but they eluded us by diving for very long periods—I would guess at least 20 minutes or more. By the time we had fatigued and begun to move on, the whale would come up and we would return again. The animals were diving in one general area of very deep water, and may have been feeding.

We turned for home port at 2:30 PM and began the run home across the placid bay, wind in our mainsail and the put-putting engine throbbing through the wooden deck against our feet. We talked of this and that—how he had left Hamburg in the 30's when Hitler came to power ("Germany was no good to live in after that"), how his family had left in a 55-ft. vessel, but could not find work in England and had to sell it, worked their way to Ecuador and finally to the Galapagos where he has been since the late 30's. He talked of ship design, of hydrodynamics (he knows a lot), of disease being brought to the islands by imported cattle and people, of the two vessels that vie for trade amongst the 2-3,000 people who live in the islands—a gentle, bright, simple man who hates the advance of "progress" into his realm where he can make with his own hands most of what he needs. Dinner he can catch from the sea—he showed me a turtle hook he uses. The turtle is sleeping on the surface and he paddles up behind and hooks its front shoulder. The hook loosens from its long bamboo pole and the fight is on. Grand eating. On and on in the warm afternoon with the sea spray sweeping across from the bow occasionally as the little ship dug into waves. Boobies diving their incredible vertical kamikaze dives from 200 ft. up, an occasional broadbill with its two fins arcing above the water.

So the day went. Productive scientifically, but more so for the people and the scene.

November 23, 1967

At anchor, Pt. Espinosa, Fernandina Island, Galapagos

Today I had the unallowed joy of spending an entire day learning about one animal. My open-mouthed sightseeing trip to the shore was over and I could ignore sea

lions playing at my feet and green herons peering with curiosity at me while I worked. I could concentrate on a single little rather drab lizard and ask what his life might be like. The lizard is *Tropidurus* (to the Ecuadorians, "lagartija"). It is about 8 in. long (adult males) or about 6 in. (adult females). The females are the more brightly colored, having salmon orange on their chins and anterior bellies. The males have salmon only on the belly but do sport a fine dorsal crest of spiny scales that the females lack.

With rather little gear for a change Ed and Fred White and I cruised ashore and landed in the midst of the mangrove swamp. The tide was wrong for landing on the lava so we spidered our way through the trees. At camp I left Ed and Fred censusing their marked marine iguanas. They have a lot of gaudy marks and streamers on all the males in the neighborhood and are trying to make sense of their behavior. Just now the males are setting up territories and beginning to spread out over the rocks in geometrical precision that is constantly bolstered by border battles. In fact they attack anything that enters their ground, including females, and even look sullenly at us when we intrude, though they never actually run at us. A bull sea lion did today, however, as I passed between him and his harem up in a mangrove thicket. He came waddling over to me barking and looking intimidating. I was intimidated, folded my dewlap, tucked in my brightly colored shirt, and slunk away.

Anyway, Ed and Fred went about their business and I mine. Mine was to catch lizards and find what they had been eating, to take temperatures and look at the ecology of both beach populations and ones inland. I started on the beach. My little lizards were scattered around, even on intertidal boulder fields in some places. They enter rookeries of the iguana, and sometimes perch on these big docile beasts. I found *Tropidurus* several times on spray-wetted rocks amid populations of *Grapsus grapsus*, the big red crab. The chance observation of two days ago of a lizard attacking a crab nearly his size and nipping at its legs made me wonder if they ate crab meat. Indeed they do. The sum of today's efforts shows that their diet is probably 95% by weight of crab, mostly small ones that are eaten whole, but a good many legs as well, including the pinchers.

They do snap up the random fly, wasp, or bee that comes near and even find a spider or ant now and then, but it is mostly crabs. This diet is a terribly salty one for an animal that presumably must obtain its moisture through its food. Thus it is not surprising to note the hillocks of salt around each nostril on these animals as the nasal salt glands dump their concentrated load at the surface.

Tropidurus is not frightened in the normal way, though it is frightened. It resolutely refuses to seek shelter under rocks or deep in crevices, of which there are a vast number in its area. Instead it is often found spread-eagled flat on some lava surface many feet or yards from a crevice or other shelter. When pursued it allows approach within a few feet and then skitters rather slowly away, hopping over cracks and crevices. Finally it will often retreat to broad lava cracks many inches in width, and there it feels safe. On the surface I have never met a more noose-shy lizard. They simply do not want that string around their neck and turn away time and time again, but in the lava crack their wariness subsides and they usually can be noosed forthwith. They never seem to nip at the noose as so many iguanid insect feeders do, but simply turn away.

All this makes one wonder about what all this tameness of island animals means. They are afraid, but in the context of their milieu. The fish in ponds or the sea are as wary as any, the penguins in the water are wary, and I have never met warier porpoises.

On land it is graded wariness attuned to the local situation. Every animal still has its escape distance but it may be vastly different than those we are used to. The safety of the large lava crack may be quite enough to dissuade the only obvious predator the lizard may have—the Galapagos hawk, a bird with a 4-foot wingspan that would have no hope of extracting a lizard from a crack. How the lizard deals with the snake I am not sure.

The lizards were dark and cool in the morning. By lunchtime the sun had made fitfull attempts to break through and some lizards had achieved temperatures in the low 30's. They had begun to assume bright daytime coloration by that time, and by late afternoon all were lighter than in the morning.

After a snack in the little tent with Ed and Fred during which meal we were accompanied by the camp mockingbird begging for crumbs (which she received aplenty), I ventured inland to see what the lizards there were finding to eat. Much to my surprise I found that when the lava flow had poured into the sea it had cracked and heaved, leaving long fissures and even valleys that led inland almost ½ mile, dotted with ponds, and fissures with clear standing sea water in them deep below the hot surface. Everywhere were crabs, far from the sea. Crabs could be seen clinging to the walls of the narrow crevices, red shapes in the murk. As one would expect under such circumstances the lizards ate crabs. Some of the ponds were staganating though, and a variety of insect larvae grew in them, plus other minute animals that the lizards picked up, probably as they patrolled the shore. Never were lizards found far from such water. The rolling pahoe-hoe lava fields were barren of all life except grasshoppers, a few tufts of grass, and a species of cereus cactus with bright yellow-tipped branches.

In the deepest recess of this strange world of dry lava and salt water I came upon a big pond with a single sea lion in it, wallowing happily back and forth barking at the warm water and muddy bottom over which he slid in obvious delight. How he got in or how he would get out I did not solve.

Very nearby I topped a lava hummock like a loaf of good french bread, all cracked at the top and smooth on the sides, and came upon a lava bubble filled with absolutely clear water. A green alga had grown on the bottom and it looked for all the world like a hot spring pond out of Yellowstone Park, only it was cool. Some of these ponds are literally teeming with fish, including some of considerable size—like the 5-lb. snapper I saw in one.

Hot and tired I returned to camp where we were picked up and brought back to the *Helix*. Its water hours on board now so I had to do my laundry by hand. That and getting ready for tomorrow (I go after sounds from the Bryde's whale again) kept me busy till note and bed time.

November 24, 1967

At anchor, Punta Espinosa, Fernandina Island, Galapagos

This morning I wanted to check up on the funny popping sound I recorded from the little baleen whale. I have been suspicious that it might be false and due to some instrumental difficulty, and in addition have felt the necessity of recording it 3 or 4 times in the presence of the whale to be sure he made it. So, after breakfast I put my miscellaneous electronic gear in the whaler and went over to Fritz and Carmen's boat, *Nixie*. They were tucked back in a beautiful little corner of the anchorage—clear jade water set about by the jaggedest rocks imaginable. Soon we were underway and past the

Helix. Before we were a mile off the anchorage Carmen called to me that she thought the *Helix* was afire. Sure enough, smoke billowed from someplace on the midships deck. We watched for some time and it finally subsided so I felt it safe to go on. Later on it turned out that Joe the cook had been cooking fudge and it caught fire, and I gather smoke was pouring from the portholes but no damage was done.

Not a mile further on we came to a huge school of *Tursiops*. I estimate that there were 200 animals, but that is no better than a wild guess, they were spread over so much seascape. Once the hydrophone was in the water I could hear a bewildering array of clicks, squawks and whistles, a constant din. Several adults and young were in the school and when these passed by the squawk or bark signals were especially often heard. One baby was very nearly newborn. I could still see the light vertical creases of its fetal folding pattern. Much to my surprise this pair ran the bow for some time. One old dark adult came up under the bow with a sprig of sargassum in his jaws. He held it as long as we saw him, which was perhaps 15 minutes. These porpoises look and act like ours at home. The only difference I could see was that the pattern on the heads of these animals was not so well differentiated into lines and striping as ours. It is more a simple dorsal dark area sweeping forward onto the snout, with lighter skin below.

We left the school and proceeded out along the north shore of Fernandina (Narborough) and finally came upon a small baleen whale. Its tall slim blow looks for all the world like that of the fin whale. When the listening gear was put in the water there was the pup pup pup sound sure enough. I was naturally elated, though when it began to fade as we drifted to a halt I became suspicious and then when the whale surfaced very close aboard three times and I heard nothing I doubted even more. Finally, after listening to another whale with the same experiences I ran out into open untenanted water and then repeated the sequence. Pup pups at first, then none. When I suggested it had to do with slowing, Carmen suggested cutting the floats free, which Fritz did and the pup pups disappeared. The floats had been tapping lightly on the cable as both streamed aft near the surface. When we slowed, the cable sank and could no longer touch the floats. Well, the literature is spared another prime example of *Balaenoptera instrumentalis*. After a nice lunch aboard we went back and I boarded the *Helix* preparatory to going ashore to spend the night with Fred and Ed. I snatched Ed's rum bottle, a cot, a blanket, and some food, and other gear and headed for the beach.

After spending the afternoon watching *Tropidurus* feed (they do a lot of things from snapping at the outer segment of medium-sized crab's legs to picking parasites from marine iguanas, to catching flies, to stalking gnats in the intertidal zone), we came back to camp and settled down in the gathering dusk to make camp. In front of the little shelter Eddie had set up a hobo billy can and had a nice fire going. He and Fred had bashed a lot of crabs and we dumped them in three at a time, boiled them for about 10 minutes, and pulled them steaming from the water to eat. They are delicious and have quite a lot of meat especially at the bases of the legs. Lo and behold they have a black pigmented membrane under the carapace, especially dark over the gills. Eddie had to try iguana so we did one in and I surrendered up my monopod as a spit. It took forever for him to cook. When he was done he didn't taste bad but he was mighty tough. There must be better ways of cooking them. We broke out Eddie's rum bottle and mixed up some passable frou-frous.

Before long the world was looking bright and we decided it was time to investigate the nighttime activity of marine iguanas. The first batch we came to was huddled into a few widely spaced groups. These grounds were sometimes several iguanas deep. I crept up on them with a thermistor lead in one hand and was able to insert it under them. Only when the light shone on me did the iguanas stir at such familiarity. Otherwise they just lay there and let me push the temperature sensor under them. The piling behavior does keep them warmer—by as much as 5 degrees.

Some of the piles were spectacular—iguanas heading in to the center like spokes of a wheel. One group we looked at was back in the center of a mangrove thicket and I had some fun clawing my way through it to take the temperature—receiving as I did, appropriate comments from my colleagues. I won retribution though by coming upon a penguin and telling them I was going to get its temperature. It sidled down toward the sea and when just over the edge of the rock where they could see its head but not its feet, I pretended to push in the thermistor, which actually was in my mouth. My, my, such comments on my stalwart nature and the height of the reading—some 35.6 deg. C. as I recall.

Such creepery is an acquired taste. Iguanas are vegetarians and their houses are not neat. So, “dusting” myself off we returned to camp. I placed my cot out behind the little shelter tent while Fred and Ed snuck inside and rolled up in their blankets. I had no more than snoozed off to sleep when I heard a loud “That’s it, that’s enough!”, and out stormed Fred, grumbling. It seems that they thought there were grapsis crabs in the tent but when Eddie turned on the light there was a rat sitting on Fred’s chest. So they started up the little generator and hoped that the light would keep the rats at bay (it did), but it made something of a racket.

I lay there looking at the sky—the sun had disappeared in a blaze of glory lighting up the great volcanoes across the bay in colored “last light.” We had luxuriated watching the sea lions play below us, the boobies dive, and the frigate birds swoop and soar over our little domain. Now I could see that the ecliptic was almost straight ahead (actually we are in the southern hemisphere by a few kilometers). Finally I drifted off. Toward morning the wind blustered through camp flapping the tent and cooling my cot and my lower portions to such an extent that I had to take action. Finally I moved the cot over in the shelter of some mangroves and slept peacefully thereafter.

November 25, 1967

Punta Espinosa, Galapagos Islands, Ecuador

Dawn woke us as it is wont to do in outdoor camps. Fred presented me with a steaming cup of coffee, cooked on a funny little immersion heater he hooks to his generator. Without further ado I went off looking for *Tropidurus*. I found them marching by me toward the intertidal zone. They spend the night inland somewhere, probably in crevices or under rocks and after an initial warming period move toward the intertidal. One animal went right through camp and laterally along the intertidal for some 100 ft. to a marine iguana colony. I found the lizard picking parasites from the big lumbering iguanas who passively allowed this servicing to go on. Much of my day was spent trying to understand display in this animal. The females have aggressive patterns as do the adult males. Both lower dewlaps (neither very far) both compress laterally and both nip and intimidate. There seems to be grades of females, some more aggressive than others. The

brightest colored ones are the nastiest, and size means rather little. One nasty female not only took on her own kind but attacked males twice her size as well. When examined internally I could not be sure of her sex. Her pattern is female, she has no hemipenes and no epididymi, but has only one "ova" per side and that looks for all the world like a testis.

I tied this female to a string and lowered her into other lizard's territories to find these things. I also lowered her near a *Dromicus* (the island snake) and it struck at her but she was too quick and leapt across the crevice in a lightning movement.

Fritz brought us a bucket full of lunch—hot grouper fillets, sweet bread, crackers and some kind of juice. We enjoyed it under the welcome shade of a mangrove tree, since the day had grown hot.

The wind rose, and with it the swell. Great white rolling and curving breakers crashed on rocks off the point, their crests blown into skipping spume trails. Eddie and I went out to the outermost point. I photographed while he walked through iguana rookeries. The swath free of iguanas was left behind him temporarily and on one point he walked rather near the edge of the cliff. The iguanas on that side piled up in squirming piles. Twice these piles of perhaps 20 animals got out of equilibrium and literally dripped over the edge and fell into the water. Eddie has been flying models over the colonies and finds the young and females much more frightened than the adult males—at least they run for cover when his cardboard "hawk" goes over.

Back on board Eddie and I decided to go fishing at dusk and took the whaler out. We hadn't trolled more than a few moments when both of us hooked up—I caught a nice barracuda and Eddie a grouper. Closer to shore the fishing was even better. In rough water near the point where I had to watch constantly for both rocks and the huge breakers just beyond we caught a fish every two minutes. We came back with 24 fish, mostly small groupers, just as the last light disappeared. We are freezing them to take home in the freezer down below. We now have quite a collection of fish.

Tomorrow I try to solve the mystery of the sex of *Tropidurus*. Perhaps they have already solved it, I don't know.

November 26, 1967

At anchor, Punta Espinosa, Fernandina Island, Galapagos

As soon as possible after breakfast I loaded my gear into the whaler and left for shore. Unfortunately the Ecuadorian guard, Luis Olayo, chose this morning to go ashore so I will have to be circumspect about gathering data on the internal workings of lizards. Once there I set out alone with my gear and walked rapidly around the shore to a rocky promontory that juts out into Espinosa Bay. I began gathering data, watching carefully to see if I could learn to interpret color and pattern and sex in these animals. I could not. There are no distinct pattern phases, one that is associated with adult males in general—a barred and spotted phase with rose ventrally and a white chin and black throat. All well and good, but in the smaller lizards females and immature males are all mixed up. Females are brilliantly colored, especially gravid females. They have a shiny ventral surface of salmon red color, a red chin and throat, and gravid females have salmon cheeks and eyelids. Also all well and good. But, in some of the larger lizards carrying this color I found testes. These were still small by adult male standards (70 mm SVL vs. 100+ mm SVL) but larger than gravid females (55-65 mm SVL). I found two lizards that seemed to have both ova and very small testes. They were salmon colored. In two cases I

found lizards that were losing the salmon color—one had it just in patches on the snout and the other on the snout, throat, and anterior abdomen. Elsewhere rose color prevailed. I found one animal with perfect male color and pattern at 75 mm SVL, the smallest I found. Other smaller lizards were all females. All in all it looks as if there is a sex reversal here. There is also a geographic distribution of sexes. Adult males are only found where there is close access to water or shore regularly altered by the tide. Inland farther I found mostly females or young. Inland I also found most gravid animals. The young males in the process of changing were found either inland or in one or two cases, on the beach. At any rate, once maturity is reached for males they occupy favored habitats.

My walk took me over miles of rough lava and I was very tired by 1:30 when I arrived back in camp for lunch. I repaired to a sheltered spot under a mangrove and spread out my meal, watching the iguanas graze with their peculiar sideways swipes of the head. Their lateral teeth are slanted outward and are hoe shaped, allowing efficient scraping. They crop algae both in and out of water. On shore one can see how closely they can graze to the rock surface. It is within a few millimeters at most, including fairly rough lava surfaces. Efficient beasts.

The afternoon was spent in another hike, this one hotter than the other. I learned a few new things but in general confirmed the idea that these lizards have at least some animals develop into mature females who lay eggs and then transform into males. There is every stage of female development here, and not related to size either. There are females with tiny ova, females with large eggs in the shelled condition and everything in between. This is typical of the equator where the day length cue is absent and where water temperature is of no consequence, as it is for the amphibious marine iguana. The latter beast has a definite mating and egg laying season, which must be cued to the annual shift in water temperature. In a month or so they will be swimming in much warmer water and the rains will be with the Galapagos.

I came back into camp with a lot of pickled lizards in one jar and some live ones in another. It was some task keeping Olayo from seeing them, but I made it safely. I'm not sure he would object, but he legally could, has a great big gun in his stateroom, and could cause all sorts of trouble. So things are being kept under wraps for the nonce.

Back at the *Helix*, Eddie, Al the electrician, and I went out for grouper and came back with about 30 fish. It was much calmer than last night and I enjoyed a lovely sunset over Fernandina Island with boobie birds flying gracefully by like black cut-outs against the fading light.

The news onboard is that the record Malcolm is setting is still intact. He has still tested only fish that live in California. Two more days to go.

November 26 [?], 1967

Trawling in Bahia Banks, Galapagos Islands, Ecuador

A day spent breaking lava rock with my feet!! After breakfast the *Alpha Helix* got underway along the north shore of Fernandina. John Teal, Fred Carey, and I were dropped off to take a hike to an inland cinder cone where we hoped to find land iguanas. Tony took us inshore in the whaler looking for a spot to drop us. The shore is an abrupt jagged black lava bluff along this coast. Swells surged in welling over the top of offshore rocks and breaking on promontories in a boiling mass of white. Shortly we located a

little point of rock with a vertical lee wall. With the skiff alongside it was simple enough to hop onto the rock as the water rose. After a scramble up the 100-ft. cliff we draped our orange life jackets on a prominent pinnacle both so we could see where to come back to and so the *Helix* would know where we went ashore. They were scheduled to return at 4:00 PM. I emptied out some of the excess gear from my backpack—a spare canteen, some juice, a light, and some clothing. Then off we went toward the cone some two miles distant across the undulating lava field that sweeps up toward the crest of Fernandina about 15 miles away. In front of us lay a jumbled mass of rounded, smooth, pahoehoe lava, broken and tilted pieces everywhere, and just to the east of us an incredibly jagged recent lava flow—almost impassable. Lo and behold, within minutes we came upon a lava tube whose roof was periodically broken into little sinkholes, usually filled with vegetation and soil, and otherwise a very smooth, domed street, about as wide as a two-lane road. It led directly toward our cone, to be sure in a somewhat circuitous fashion, but we felt that it was following contours and not wasting our energy. The likeness to a street was greatly enhanced by the jagged tiled blocks and fragments that made up the terrain on either side of us. I made some such comment to Carey and Teal as, “Well, the least the Ecuadorian government could do would be to paint a center line in their streets” when one appeared. It was accurately central and it was lighter and about the width of a normal painted line. I looked closely at it and determined it had something to do with the layering of rocks around a lava tube that reached the surface along the top of the dome-shaped tube.

We ambled happily along, looking at the low vegetation about 3 ft. high that I think maybe a variety of *Scalesia*, the Galapagos endemic that flourishes in the high country of the islands. We had noted large tail tracks in the patches of soil along the trail, and we had seen some large burrows and scats that seemed to be from the land iguana, and then suddenly, right in the middle of one of the collapsed parts of the tube stood one. I wasn't prepared for him since the only other one I had seen was at Academy Bay. It was dark gray, and other than having a salmon-colored eye, was drab. This beast was about the size of a fox terrier—perhaps 5 lbs. in weight—and maroon over the abdomen and tail and his head was a bright yellow. He stood up in surprise at our intrusion of his home but did not flee until we approached within about 3 ft. Then he rumbled away with the widespread limbs of the reptilian gait, like some impossible creature out of a bad movie about the cave men. He stopped, bobbed in a grotesque limber-necked bob, jowels jiggling. Finally after some impositions upon his good nature he retreated under a tiled mass of lava sheets. Like a good Galapagos animal should, he left his tail out, so I extracted him, being very careful not to get within range of his very powerful jaws. His head is a mass of knobby excrescences, probably used during territorial battles. Finally, we released him, happy to have seen this creature that is reported to be so near to the verge of extinction. Reports are that only a few colonies exist and those of a few animals each.

On up the slope we went and finally our “roadway” gave out at the edge of an overlying lava field. We would have to cross it. It is difficult to describe adequately the impassable nature of these flows. One simply could not cross one of any great extent, without long and tedious, wearing effort. We had to traverse perhaps 500 yards of sharp cindery slag, loose pieces ranging from pea size to ones weighing 500 lbs., each tilted against the others at crazy angles and most in delicate states of equilibrium. Pinnacles of

jagged sharp knobs and spikes rose up everywhere. A footstep usually rearranged some pile of rock, some broken and other pieces tumbled into airspaces hidden from view. Shoes got wedged and had to be pulled free, sharp points sliced at soles and shoes, and sometimes higher. As often as not one had to brace for a step with a hand and there was no place one could put a hand that would bear weight without cutting or simply pain. We finally made it across, reaching an undulating mass of rounded lava bubbles and tubes. This was easier walking, especially since interspersed among the lava were stretches of soil and vegetation. The rock was dangerous walking too, as it was difficult to tell when underfoot lay a tube inches away. Several times my feet crunched through and it was all I could do to keep from falling.

The sun came out and we welcomed the nice sea breeze that swept the slope in periodic gusts. Even it was relatively warm this far inland and I began to sweat pretty heavily. I hate to think of what it would be like on a really hot day. I hauled out my canteen and was chagrined to find that it leaked. It was only about half full, but we enjoyed a good drink and pressed on toward the cinder cone ½ mile ahead. Palo santo trees made their appearance—strange leafless trees with a smooth white trunk, usually 10-15 ft. tall, plus a spreadig mass of obese-looking branches and twigs. Even bare they cast some shade and were welcome when we stopped. They also formed the resting places of the land iguanas (*Conolophus*), who at this time of day (12 noon) were seeking shade. We saw several, and the entire terrain, save the lava flow, was a mass of tracks and burrows and scats. I cannot believe that there is not a large population over quite a part of Fernandina.

The little lava lizard, *Tropidurus*, was present as far up the slope as we hiked. I noted two things of interest about it. First, in general, individuals were very much smaller than those living on the beach. Males with crests were no more than ½ size of those down at Punta Espinosa. Then, more interesting still, while those from Punta Espinosa were very brightly colored with salmon and pink, these animals were almost devoid of either—the merest hint of pink appeared on the abdomens and chins of adults. I think this is probably because these lizards cannot eat crabs and that the pigment comes from the food. The size problem is more perplexing but surely must be related somehow to available food. One normally thinks of animals as having an “adult size” but here it may be flexible to fit the conditions of the environment.

On we went. The trees became thicker and we could see that farther up the slope they formed a real if open forest over the old lava flow slopes. New lava is devoid of all life except lichens and an occasional spider spinning a web hopefully between barren craggy pinnacles.

Finally we reached the crater. It has a series of vents on the downward slope that must have poured rivers of lava at one time. Now they are empty chasms of red and violet lava, running underground into darkness in a couple of cases. One is a pit of undetermined depth. I could see down perhaps 50 ft. when darkness obscured the rest of the tunnel.

The crater itself is about 500 ft. across and on its rim we saw the first aborescent cereus cactus of the walk, a scraggly looking plant with jointed stems rising some 25 ft. from the very rim of the crater. Shortly after descending we ate our lunch in the company of a big land iguana, all of us basking in the sea breeze funnelled in between the crater and the adjacent slope. We decided to go a little farther into the palo santo forest before

turning back. I gathered the delightfully aromatic gum to take home. It must be much like copal gum used by the maya (or was it the mixtecs?) and the material thrown into Chitzen Itza with the maidens. It is probably also close to myrrh for which the ancients expended so much. At any rate a few trees were found from which the amber yellow sap had run and collected in big globs and hardened. I smell of the stuff now myself, enough to cause comment at dinner.

I sat on a smooth lava slope to watch the behavior of a big iguana while the others hiked on, looking at birds (many Darwin's finches and a few Galapagos mockingbirds and one Galapagos hawk). Iguana-watching must be closely akin to studying the habits of sleeping Mexicans. My animal did two things in half an hour. He moved his head from right to left and he flipped his tail out of the sun when the sunny spot next to him moved with the advancing day.

We started back shortly thereafter to meet the boat at 4:00 PM. Downhill is almost worse than uphill as cracking rocks happen more often as you step heavily upon them. I couldn't find the highway and instead walked to a big dune on the beach adjacent to our orange life-jackets. Enroute I encountered a few more iguanas—probably about 15 for the day, but signs literally everywhere, even the crater rim. I really do not think they are on the verge of extinction, though I must admit I saw nothing but adults. Not even a $\frac{3}{4}$ grown. Each was encountered alone, and usually some distance from the next animal.

Back at the bluff we all collapsed and drank some apple juice and nice cool drafts of water from the canteen. Then we slid down the sandy slope to the bluff edge and waited for the boat. It was a delightful spot, filled as I was, with pleasure at lying motionless on my jacket in the cool sea breeze. Below us was the green sea crashing on the rocky coast. A squadron of 6 penguins cavorted below us. They periodically ducked under and rocketed off like tiny torpedos. Their maneuverability and speed under water are well nigh astounding. We came to feel that they had two sectors to watch—above and below water and that periodically they felt it necessary to sashay around below the surface. They followed some bait that went by, with sooty terns above—a very dark gray form with the merest hint of white on its head—and penguins below. After a submersion the penguins pop up to the surface as if quite buoyant.

Marine iguanas were plastered over the rocks in front of us, the males huffing and puffing at each other. Several flights of boobies went by in formation. I hadn't really realized how graceful they are—but they are pursuit planes of the bird world, graceful, swift. I got a pretty good fix on one diving. He began his dive at bluff top, which we estimate to be about 100 ft. I know I have seen them start higher.

Finally the *Helix* steamed into view and we boarded without incident. It was delightful to get a shower and a drink of cold water. Fred and John produced three huge bottles of Panamanian beer which we cooled and swizzled down with great joy. Now we are trawling in Banks Bay and have just hauled up a scorpaenid fish that has been seen only once previously—that on the Albatross Expedition in the later 1800s.

I'll quit. Tomorrow I try to identify the baleen whale and collect a few samples ashore for chemical analysis.

November 27, 1967

At anchor, Tagus Cove, Isabela Island, Galapagos Islands

This morning I had intended to spend the day first in trying to identify the small whale and then in the afternoon finishing up on observations on *Tropidurus* and in collecting some of the grapsid crabs for analysis of the carotenoid pigments in them. This I hope, will allow me to say something about the source of color in the coastal lizard populations, and its absence in the ones from the uplands.

But, all was not to go that way. No sooner had we put the shore parties ashore (Malcolm and his crew are going ashore for their first time, having spent the entire remainder of the trip in analysis of fish muscle on board. How they could come to the Galapagos and do this is a mystery to me.) than we spotted a school of bottlenose porpoises. They soon ran the bow and Tony fired a harpoon into one. Soon we were off in the skiff with the animal towing us, about 300 ft. of 1/2-in. manila, a 50-gallon drum, and the whaler. This went on for three hours, and each time we thought the animal might be tiring it proved not true. We pulled ourselves laboriously up the line till we reached the thin, braided nylon line which was almost impossible to handle with bare hands and a plunging porpoise at the other end. The sun beat down, our arms and legs and backs grew weary, and still he plunged on. Finally I suggested trying to dispatch him with a .357 magnum pistol that we had for the purpose. I fired twice, feeling sure I had hit him once, but still he went on. Then we cut him loose on the buoy and speeded up close and tried again. I could see him flinch as I fired, but still he went on. We had to return to the ship for more shells and a new pair of gloves. On and on. We had passed Punta Espinosa three times at about 2 knots. Finally I got very close and shot. This time I was sure of a hit as the animal rolled over in a paroxysm and died. Whew. The harpoon had hit a rib and glanced out the superficial blubber. We had him by the skin and little more. The harpoon was nearly broken loose. I spent the rest of the day preparing him, measuring and flensing. Meanwhile we tried to find whales but did not succeed.

All is now preparation for leaving. Gear is being gathered together for storage, lashed down and rearranged. The Angemeyers came aboard and we watched a long film together, and then they left in their little cocklesheel boat into the darkness. We watched the dim lights turn on in the *Nixie* and then went below. Fine people. They will go to Quito for Christmas. I imagine that one or more of us will return one day to sail with them, who knows.

November 28, 1967

Before noon the *Alpha Helix* upped anchor and stood out into a windy Bolivar Channel. By the time we had rounded Webb Cove at the southwest corner of Isabela, a big sea swell topped by tumbling whitecaps hit us. Bob Sahara got sick first and the others of us more or less followed suite, at least to the level of feeling mean. Before very long the ship changed course and ran the southern shore of the island and finally, late at night, fell into more or less of a lee. We woke in the morning off Wreck Bay.

November 29, 1967

At sea, enroute Panama

Papers were surprisingly easily cleared up with the local officials. Olayo went ashore burdened down with gifts from us, alarm clocks he had bought, jugs of ice cream, and nameless blobs of meat that he had talked Joe out of. A nice, simple fellow, who will

be content with his family and a job in the cattle ranch on San Cristobal or work as a fisherman, after his three-year hitch in the Ecuadorian Navy is over. Once out in the channel I brought my lizards out and gave them air. The *Helix* rolls quite a lot but is much more comfortable with the sea on our quarter. A pool was set up for speed to Panama. I'm guessing 10.22 knots.

Ed and I set up the porpoise watch again—not a beast seen. Birds, even, are rather uncommon. We crossed the equator today and after leaving the northern parts of the Peru Current the sea began to warm. The sky is eternally overcast it seems, but it does abate the heat.

November 30, 1967 (or is it Dec. 1)

At sea, enroute Panama

Nothing today but moderate seas and trades. The weather is better and the swell less so we feel better. There are even very few birds. The sky has been overcast all day.

December 2, 1967

At sea, enroute Panama

Late this afternoon we saw a whale spout several times far out in this lonely ocean. Nothing else but scattered birds. What a long way between animals!!

December 3, 1967

At sea, enroute to Panama

Early this morning the land of Punta Mala was sighted and all day we have been passing debris in the water including whole trees. Birds are much more abundant including a couple of pomerain jaegers that have flown with us nearly all day for some unfathomable reason. About noon we began to sight sea snakes—one every few minutes floating on the sea surface. As we pulled adjacent to Punta Mala about 5 miles out a school of “spotter” porpoises came alongside and ran the bow—beautiful big stenellas—all flecked with white dorsally—some to the extent that the spots coalesce into broken chevrons and other pattern varieties. Among the school were some smaller animals with similar proportions and pattern except that they were brown without spots. These, I think, are immatures, since I saw one nearly as large as the spotted individuals with a few spots dorsally. At Punta Mala the pool was figured out—I had 10.22 knots and 10.25 won, believe it or not a guy had that number exactly Oh well, my record is still pure.

After settling the pool we slowed to about 5 knots so as to make our ETA at 3:00 A.M. Then Eddie and Terry were able to dipnet snakes—a thing dear to their hearts. Soon they had four bright-black and orange-yellow animals with oar-like spotted tails, black backs, and orange venters (*Pelamis platurus*). They were utterly incapable of crawling out of water, their deep ventrally keeled bodies not able or adjusted to making purchase on solid objects. They bit the snake bag each chance they got and hung on with bull dog tenacity. I'll not get too close though we did find that they can't rear up when picked up by the tail.

A few more porpoises, snakes, and then dusk over the shining gray sea under a blanket of clouds.

June-October 1968

South America Trip

June 24, 1968

Mexico City, Mexico

Norris packed up 16 assorted suitcases, plus a handbag each, filling Francis's car and Joan Wright's. We were 140 lbs. overweight but had chits for 240, so, with the plane flying at an angle to the horizontal, we cruised over the Gulf, looked down on Angel de la Guarda Island where Eddie and Rob Shallenberger were camped, over Mazatlan and thence over clouds to Mexico City. It was raining when we landed.

We successfully checked several bags, including the heavy book box (we are carrying everything as we can't trust Chilean customs). Shortly we were stuffed into an Avis car and left out to brave Mexican traffic—not as bad as Rome's—but bad enough, the old chicken game with no white lines or road signs. After about two hours we found our hotel on the Paseo de la Reforma—the Hotel Montego. Very nice—all hewn beams, tile, and carved wood furniture. Everyone was tired and perhaps a little shaken by the ride and glad to spread out bags and set a spell before dinner. Shortly we all rode up to the Cinto Piso for dinner. Except for Nancy, the kids ordered hamburgers and found the spiced and chopped meat not to their liking at all. The peaches for dessert were the same and by the time we ordered ice cream they were too tired to eat. Off to bed, for tomorrow we hike to Chapultepec Park and drive to the floating garden.

June 25, 1968

Mexico City, Mexico

After some dawdling around we trooped into breakfast which, because there were scrambled eggs, pancakes, french toast, and other E.W.A. goodies, was reckoned by the children as a grand restaurant. Afterward we walked through the rain to Chapultepec Park, a grand swath of trees and children's areas, etc. The Paseo de la Reforma is a lovely boulevard too—tree-lined, red tile walks being put in for the Olympiad, lots of traffic, smart shops, rococo sculpture of generals (none on horses so far as I could determine), amazons, and such.

In the park we visited the Museo Anthropologia, a magnificently architected building in the form of a closed square. The quadrangle actually is overhung by an enormous flaring roof supported by a single dark stone column. The roof is said to cover 2/3 a football field in area. The buildings take their motif from Aztec and Mayan temples being of tightly morticed stone.

Inside is a magnificent display of artifacts, from the very earliest times on. We walked and walked and everyone got very tired, so after a nice lunch in the bright, airy museum café we caught a cab (a new experience) for the hotel.

The kids rested while Phylly and I walked uptown. It is a teeming, cosmopolitan place with much European influence. I like it and would like to return for a longer stay. In the evening we walked to a very American restaurant (Shirley Courts) and had a very American and rather so-so meal, but the kids were reasonably pleased except Nancy who was served breast instead of legs of chicken. Back to the hotel. Tomorrow a drive to the pyramids.

The altitude and the traveling tire the kids so we are at about ½ speed.

June 26, 1968

Mexico City, Mexico

The great hamburger hunt is in full fig. Everywhere we go we look for hamburgers—plain, no mayonaisa, no tomates, no lechuga—only a bun and meat and french fries if possible. The Hotel Montejo is off limits because they put cereal and spices in their meat, the Restaurante Teotihuacan is off limits because they put sauce on their fish. Only the Shirley Court and the VIP restaurant qualify as edible. All the while Phylly and I year for food of the country. Oh well, another time, I'm too weak to fight.

Up this morning with Susie feeling a bit woozy and tired. I gave her a pill (for minor bellyaches) and after breakfast we hiked around the local shops. I turned briefly without peripheral vision and people divided into two pieces but this nearly passed by the time we returned [?]. We looked at all kinds of goodies, especially for a blue or a gold purse for Phyl which we did not find. We trooped down to our waiting car and it failed to start. It failed and failed and failed. All the wisdom in the parking lot failed to start it. (This wisdom almost failed to get the air cleaner back on as well). Finally I found a knob sticking out and pushed it in. The car purred to life miraculously—it was the choke disguised as an air vent knob. I quietly accepted the miracle, tipped the magician, called the family from the lobby (and nearby johns), and drove out into the hurly burly of Distrito Federal traffic. We made our way circuitously out Hwy 85 to the north of town. Shortly we rode into farmlands, cornfields, maguey patches, little shanties that the children could hardly believe housed whole families, even though they stood in the muddy doorsills and their laundry was strung outside.

The road lifted up to a new toll road and shortly we came to Teotihuacan—a ramshackle farm town of Aztec people I am told still speaking Naujuatl, the Aztec language. Just beyond were the grand remnants of a 2,500 year old civilization—two huge tiered pyramids (of moon and sun) and many outlying buildings and canals.

The kids left the car, stooping over. Norrises all seem to have their eyes on the ground—this time looking for obsidian flakes and potshards (both abundant). The obsidian blades flaked from a cylindrical core are everywhere—all broken.

After stoking up on pounds of these goodies (will we ever make it to Chile?), all fled to the nearby rows of shops and emerged little scathed, visited the small museum and walked out into the Cierdadella—a group of low pyramids and patios alongside the Canal de los Muertos which runs down the center of this ruin for more than a mile. Its name comes from the many skeletons found during its excavation.

All picked up potshards—black ones, red and orange ones, ones with some kind of glaze, and ones with incised patterns. Before we reached the pyramid of the sun the showers swept over the broad valley and us. We hot-footed it back to the museum and had lunch at the nice restaurant above. Dicky didn't like the sauce on his fish and therefore had to share other people's roast beef (from which the gravy was carefully scraped).

After this we drove around to the pyramid of the sun, a great tiered mound, faced with stone. Up the steps we went to the top (except Phylly who puffed to the first tier). The top proved higher than the bottom and to have a slightly better view. It rained again and I got wet as my coat was pressed into the service of Susie (who has a beastly cold).

The temple of the moon was next—at least the priestly outbuildings that are being restored. Frescoes of red paint were everywhere as were carved columns, symbols of planets, and wind.

On back to town more directly and a brief but highly accepted meal at the VIP.

June 27, 1968
Guatemala City

Up this morning with visions of a leisurely look at downtown Mexico City and a drive to the airport! After breakfast (and a copy of the *L.A. Times*—the world seems to be holding together fitfully), we caught a cab for the Alameda district. Downtown is a bit busier, smokier, older, and more tawdry than the district of the Montego Hotel—even though our guidebook says it is the “pink light” district. Barbara bought a glass cat and a glass chipmunk so small I could scarcely focus on them—1.50 pesos each.

We poked around various stores for a while, looking at brass bedsteads, stuffed boa constrictors, and such. We jumped in a very scruffy cab with a very scruffy driver and soon were back at the hotel where I called the airport and found to my horror that the plane left an hour early. We rushed—paid the bill, packed the bags, fidgeted while the car didn’t come, sat Barbie and Dick on a suitcase, the back being full, and braved the way out into about the worst traffic we had encountered yet. It seemed forever before we got around the block to the Montego again. Out in the Paseo de la Reforma we crept and crept. I became a bit acclimated to traffic and even buffaloed a few Mexicans in my desperation. One never knows what street is next as there is never a sign. The local folk all agree when you say, “Is this Avenida Consulado?” and it turns out to be Avenida Juarez. Finally, by luck and seat-of-the-pants navigation we found the airport, missed a miniscule turn, and got trapped on a throughway that took us nearly back to the Montego before we could get off! We had half an hour to plane time and no lunch.

Finally we screeched up in front of the terminal. I sent Phylly off to cope with Pan Am (a rough job at best) while I turned the car in. Somehow we retrieved our checked luggage, had passports cleared, and made it out to the plane. Praises be—even though it was only an hour and a half flight we were to be fed. We all sank into our seats, only to find that I had been assigned a space with no seat over the emergency slide. The plane, after all, was Pan Am. As we took off we skimmed over the valley of Mexico covered with broken clouds. Popocatepetl reared its majestic fluted head, covered with streamers of snow, part way out of a cloud.

The meal was good and the flight calm. Below us we saw the low isthmus of Tehauntepec and Yucatan stretching away to the east, obscured largely by clouds. The broken hilly country of Guatemala came quickly and soon we landed in a light rain at Guatemala airport. After the outdoor exercise of dealing with our mountain of luggage through customs we caught a cab with a nice driver who told us about the aqueduct built by Alosnaz in the mid 1500’s—arches like those in Rome, the mini Eiffel tower dedicated to the Revolution back in the 1800’s when one president replaced another, etc.

Our driver stopped for pedestrians and other drivers—unheard of behavior in a driver in Mexico—we began to like Guatemala. The town has between ½ and 1 million people and is of varicolored stuccoed flat-roofed buildings, grated, narrow sidewalks, all kinds of people filing by, indians, suave businessmen in dark glasses, kids, beggars,

vendors of cactus candy, and many nameless lumps of food, nuns, little cars, wagons, trucks piled high . . .

A walk in the plaza, a shoeshine from a smiling little boy named Fernando, band-aids on Phylly's blistered feet, a look at the old tiered Spanish fountain, the Palacio Gobierno, the big church with bells clanging tinnily—pigeons on the sculptured door and back to our hotel. We had a fine meal of which everyone approved even though there was nary a hamburger. Great Scott. I had carne asada, Maya style with salsa picante, frijoles refritos (it looked awful—a blackish purple blob that looked like an error or someone sick in the kitchen—but good once I screwed up my courage to try it). Phylly and I had some kind of roots cooked like potatoes with a sauce—very good.

Off to bed. Tomorrow we drive to Chichicastenango and Lake Atitlan.

June 28, 1968

Up about 8, ate breakfast and signed up for a car. A Plymouth station wagon showed up, piloted by a trim Avis lady. Soon we were off toward what we hoped was Santo Tomas de Chichicastenango. Before we ever left Guatemala City we became enmeshed in a maze of roads without signs. After much palaver and retracing of steps we found we had been on the right road all along. However, not for long. Going blithely out of town, we passed an innocent, buff-colored sign about 2 ft. square and a dirt alleyway. They turned out to be the Pan American Hwy., while our broad paved road proved to go to San Raimundo, back in the hills, wherever that is. It was a lovely if circuitous drive through farm land and mixed conifer, cypress, and oak forest. We stopped twice above rushing muddy creeks cut far down in steep canyons. Diverse broad-leafed vegetation clothed the walls, ferns, labiates, melastomes, what look like nettles amongst many others. Up in the oaks were sometimes dense florals of bromeliads, intermixed with ferns and tree cactus. A racer with two dark stripes flowed off into the brush.

Periodically, we came to little towns, usually on hilltops. In each we were supposed to take a one-way street to the right—it took two towns before I caught on. The indian influence is strong here. Most of the campesinos were in indian garb, which is markedly regional. In most towns the plaza was occupied by squatter indians under cloth shelters, baskets of nameless roots, orange cooked objects like shrimps, wood, cloth, ollas, etc., spread out for barter. Streaming into town were men and women carrying items. The women walking in pairs, a twisted roll of bright purple or henna cloth on their heads surmounted by a burden—an olla at a crazy angle if empty, upright if full, laundry neatly wrapped in a bright cloth, and men and even small boys 8 years old or so, bearing great burdens of firewood, racks of ollas, sawn boards, etc., by a [?] line and leather forehead band, walking in little choppy steps. Many men dawdled along the road, machete always in hand, bearing huge skinny hoes for terracing and weeding. We saw them working plots that must have been nearly as steep as 45 degrees.

Finally we ended at a little sleepy pueblo and I stopped to ask a cobbler where the road led. He peered at me through his Benjamin Franklin glasses and explained I was already there—namely San Raimundo. We backtracked and finally cut off on a good graded road from San Juan near a shrine where the kids had found a lot of pottery and I had located a now apocryphal survey marker stating “Don't deface—International Hwy”.

Up over rolling hills we went—the air delightfully cool and breezy—thunderheads all around. At one point the kids found obviously old pottery and obsidian

in a road cut. Finally we dropped down a long forested slope and came into a little town from the back side—San Lucas. Soon we hit the “Carretera Nacional” as they call the Interamerican Hwy in these parts. It is a splendid 2-lane road with good markers and a center line of all progressive things.

Before long everyone was starving and no lunch in sight—so I drove into a village along the road, located the panaderia and bought an armload of pan dulce for 75 cents. We munched more or less happily but dryly until after cutting off at Panchull we stopped for gas and naranjas all around (gasevsas). The tasted like papaya juice and were warm but slaked various thirsts.

Our road took us up over mesas of carefully tended fields, through long alleys of cedars, through hamlets and villages and down long circuitous grades and up again. These were usually heavily forested with pines and oaks. Often in them we saw terraced gardens clinging to slopes, the terraces formed of walls of adobe bricks set on end in long rows. We passed several beautiful ranches or granjas set in forested glades with beautiful brick, plaster, and tiled houses.

In one village the women were carrying ollas on their heads as usual but 3 or 4 had garish ones of polyethylene plastic. I suppose the end of the olla is in sight. All the women gathered around the central Spanish fountain and held hollow bamboo poles up to the overflowing lip of the topmost tier on the fountain and let the water run into their ollas. Thus did they obtain a day’s supply of water for the house.

Finally after two hours or so the road led us up on the steep slope of a volcano and Lake Atitlan broke into view. The travel folders cannot exaggerate it hardly. It is set in a precipitous walled valley, cliffs in many places, and bounded on the NW by three nearly perfect volcanic cones of large size. Many of the slopes are tiered gardens—others mixed conifer forest. A few little villages sprinkled on verdant lava fans on the lake’s edge. The lake itself is clear blue and nearly 1,500 ft. deep in places. All around are clouds in white and gray billows—wisps of fog cling for moments to the cone tops, move away, and reappear.

We wound our way slowly down to a little village of Panajache above the lake and thence to the Tzan Tuyu Hotel, where we had sandwiches to sustain us on the way home. The girls were decked out in their new colorful Guatemalan shawls which we bought in the village. We watched the lightning flash in a storm caught between two volcanic cones and then were on our way again—up the winding road to the “Carretera Nacional”. Everywhere were indians walking on the road, hiking long distances up and down this precipitous land to their thatched huts. Many were drunk from some source, either staggering along across the road, shaking fists at the sky and muttering or being helped by others. One pitiful little boy sat beside an adult out cold on the ground near the road’s edge. No women were drunk—it apparently being a man’s privilege. I suspect pulque as the source, but it could have been a narcotic (it was corn beer).

One man flagged us down on a curve and when I saw he was drunk I drove on while he yelled imprecations at us and shook his fist.

The men were very uniformly dressed in purple-striped floppy pants which I coveted though it is unlikely that I could get into a pair, since the indians are nearly all small and wiry—5 ft. to 5 ft. 5 in. in height. Most had a rough brown and tan jacket around their waists, no shoes, a camisa like the pants, and a hat. Some had a long cotton

ribbon of red, purple, and yellow with patterns of birds and other objects wound around the head like a turban.

Finally we joined the highway and pressed for home. At times rain fell in sheets. I turned every knob on the dashboard looking for the windshield wiper—lights went on and off, wind came in and stopped, the car choked and purred, the back window went up and down, and finally I found the wipers and water squirter on the windshield. The warm concrete sent wispy clouds rising from the road so thick that they nearly obscured the road from view at times.

In San Lucas we flashed by an object lying at the edge of the road. I saw it was a man and swerved enough to stay clear by 3 ft. or so. I could see his head was actually on the road and his body off to the side—obviously drunk. Clearly no place to run over anyone.

Finally, after a long ride we arrived back at the hotel and quickly retired for the night.

June 29, 1968

Guatemala City, Guatemala

What adventures today? Who knows as we start but the day evolves and an almost endless kaleidoscope of impressions seems to result. The kids insisted on a ½ day moratorium on sightseeing in favor of swimming in the hotel pool. Phyl, Susie, and I watched while Barb, Dick, and Nancy cavorted in the pool. Back in the room the kids decided to take a rest so Phyl, Dick, and I took a walk to the big mercado, a few blocks away. We pushed our way down the crowded sidewalk under hundreds of varicolored signs vying for our attention.

Soon we came to the mercado and were surrounded by salesmen trying to sell wares. Phyl turned bargainer (thank goodness one of us can do it) and I joined in. What a deadpan uninterested team! We beat the tradefolk down to less than ½ for a shawl and some bedspreads! Imagine that! Whole undreamt of vistas open! We wandered into the main mercado—one of the most interesting I have ever seen. Hundreds of tiny shops under canvas with stalls filled with everything imaginable. Inside the great barn of the main mercado were similar stalls full of produce—meats—(cows parced into 800 fragments), fish from the lakes and rivers and even the sea (I saw sierra and mero, or seabass), robalo, periwinkles, cichlids of several kinds, catfish, turtles, etc. We asked all kinds of questions—learned about split acote wood for lighting the house, incense, yucca root, etc.

After lunch, amid general griping about relentless parental sightseeing, we piled into the car to go to Antigua, the ancient capital not only of Guatemala but much of Central America, and a center of Spanish culture.

Once in the car we rapidly left town—this time knowing the way and knowing how to deal with pedestrians and other local eccentricities of the highway. It was a lovely drive to Antigua, many of the roadcuts showed contacts between a 20-30 overburden of volcanic tuff (ash) and an underlying conglomerate. We could even see, in one place, where an ancient river cornice had been obliterated by this volcanic “snowfall”. Antigua soon appeared, nestled deep in a verdant valley between two huge volcanoes. This old town had been established with the first coming of the Spaniards in the earliest 1520’s. In 1541 a great eruption of Volcan Agua covered the old town with a

flood of mud and water, burying it. It was rebuilt on its present site only to be destroyed again in 1773 by a fiery eruption of Volcan Diablo to the east. This time many stone buildings stood, partly in ruins, and remain today. Some of old town has been excavated.

As we drove into town we were met by a young fellow on a bicycle who offered himself up as a tour guide. He seemed knowledgeable and pleasant so I piled his bicicleta in the station wagon for a tour. His name was Juan Jose Hernandez.

First we inspected an old convent, including a catacomb that had survived from the eruption of the water volcano. We crawled down into a domed crypt and could see the old altar and painted cross from more than 400 years ago, and the place where the dead man was calcined before being placed in one of the row of crypts.

Dick liked this place as he found a little clay effigy in the muddy floor.

On down the cobblestone streets toward the old city—partly excavated but mostly yet below ground. Jose had to show us a new hotel not yet open, in the old Spanish style. It was lovely—formal garden and fountain, rooms of original or carefully copied furniture, beautiful tiled floors, hand-hewn beams, arcaded passageways, and an old formal dining room, armor on the wall, and great high-backed red brocade chairs. Rising almost from the garden walls edge is the verdant green peaceful slope to the huge water volcano. Its easy to see how its coming to life would cover this peaceful place and the entire adjacent town.

The author Bernal Diaz lives at this place, we were told. On we went, to an ancient spring from the slopes of the water volcano, contained in a dark old cement channel and pouring into a deep vat where the clear water spread to a rectangular pool perhaps 80 ft. long and 30 ft. wide, each side lined with a row of little sub pools used by the washerwomen of the town. Today it was pool cleaning day so baffle boards had been removed and a moderately industrious scrubbing was going on.

Next we pulled up in front of the homey old church to find a black suited marimba band playing as 3 giants swayed and danced to its strains. These giants were cloth over a wooden framework and two had store dummy heads. The festival of the giants comes once a year and celebrates the feast day of San Cristobal. Later we met them again, swaying and swinging along a cobbled street with a flock of half-frightened small children running well ahead of them, looking over their shoulders as they ran. Behind followed a crowd of gabbing adults. Others came to doors or peeked out of windows.

Jose led us through dirt streets out into the coffee plantations nearby—all shaded by huge silk oaks. Reed screens lined the road to keep pigs and other sundry animals out of the little patches of corn. On we went, up over a ridge and down into a deep verdant valley which I thought was the caldera of a old volcano. In its bottom was scattered the indian village of San Antonio de Aguas calientes, home of the Aguascalientes indians, noted weavers. In the center of town stood the stolid old catholic church, very ancient, clanging its bells.

As we started down the steep, rutted road a flash of color caught my eye. Up on the slope above the road stood a thatched ramada and house. Under the shelter brightly clad women were working at waist looms, weaving exquisite shawls and clothes of one kind or another. I stopped the car, asked Jose if they would let me photograph them weaving. "Sure, for a price."

As we hiked up the trail to the ramada I saw two pleasant-looking, broadfaced indian women and several children, two of whom were weaving intricate patterns. All were decked out in wrap-around skirts of heavily decorated, multi-colored material, slip-over blouses likewise decorated with elegant shawls bearing a variety of motifs. Their black, shiny hair was braided and caught in bright cloth. No shoes. They sat on mats with the loom attached to one of the poles of the ramada, their bodies leaning back just enough to keep tension on the loom. Smooth, shiny, wooden beater sticks and two sticks to separate the warp were inserted.

I watched one child of 8-10 putting in a Quetzal pattern. She reached to her hair and pulled a wooden needle free, bearing white thread. With this she picked at the warp inserting the white thread at the right place and a quetzal row emerged.

The indian lady wanted Phyl to try on a blouse. Phyl demurred, but with my urging agreed. In moments they had her dressed from head to foot, even including a head circlet and basket perched on top. All had a giggling good time.

I ascertained that the elder lady (perhaps 40-45 years, 4 ft. 5 in.-5 ft. 1 in. tall) was named Florentina Hernandez Lopez. She was an Aguascalientes indian, was married (she wore an orange skirt, unmarried women wear green), had never heard of a whale or porpoise, knew about scientists and typified them as archaeologists, was delighted that we were interested in her work and appreciated its beauty. She was jolly, I thought, and her children fat and happy from all appearances.

We had to commemorate the occasion by buying one of her finely woven wares which she insisted took 3 months to weave (I expect it is more like 3 weeks). We picked out a shawl with things of importance to the local people. These include motifs of margarita flowers, arrowheads (puntas de la flecha), pepitas (seeds of a gourd), the crown of the queen of the pueblo, little chickens (pollitos), and quetzals, done in several colors.

On the way out I gave some of the little children dimes which they clutched eagerly. On our way back the lady waved but the kids rushed out for more dimes—which I didn't have.

A brief tour around the village and we turned back to Antigua where we visited the Pension Ruiz, a lovely place of 10-12 people, run by the Ellis family, Sylvia and Mr., the place to stay, I think, if one goes to Antigua.

After saying goodbye to Jose we had an uneventful trip to the hotel.

June 30, 1968

Somewhere over Colombia

After leaving the somewhat tattered and garish "Las Vegas Modern" confines of the Maya Excelsior we checked in at the airport and completed a lot of complicated negotiation over baggage and tickets, mostly to convince the agent that we had more baggage allowance than we needed.

We killed a little time at the zoo and in a drive out of town a way and then checked our car in. Phyl picked up a couple of wedding necklaces of interlocked silver bands made in the upland village of Coban some 100 miles inland from Guatemala City. During the marriage ceremony the partners place the necklaces over both their heads and then the girl continues to wear the "unbreakable band" as a wedding ring.

We boarded in the rain and flew uneventfully to Panama where our time was spent in immigration matters getting Dick a wallet and in teaching Braniff about baggage allowance certificates.

We boarded again at 11:30, an hour later, and were awarded some tokens worth a buck each for our inconvenience.

The plane landed at Guayaquil, Ecuador, where we trod on Ecuadorian soil and took off shortly for Lima.

July 1, 1968

Lima, Peru

We landed through the overcast at a little past 1:00 AM, with everyone dazed with sleepiness and walked into the brilliant glassy terminal. I changed a few bucks into an incredible wad of soles (431). We shoved the entire load of baggage through customs with rather little trouble and hired two taxis to take us and it to the Hotel Continental. My driver told me a whole lot of things in Spanish and when I explained that one of his words was unknown to me he said it louder—still I didn't understand. He came around from behind and said it again—no sabe, señor? No. He came in the other direction but I never did learn what was up. Before he could try inversions or reversals we arrived at the inauspicious-looking entrance of the Hotel Continental—a sort of businessman's hotel deep in the city. No one had any change, and our driver was angry at having to handle all the luggage and so finally I let them have a 500-sole note between them—about 11 dollars, and off we went to bed. The rooms were barren though clean.

We soon found that there were no more than 10 springs per box spring and at least 3 boards of stout dimensions. One caught me halfway from knee to hip. The pillows were very elongate sacks filled with lumpy masses and balls of kapok. They gave not at all. Sleep was impossible for me, compounded by the roar of cars honking their horns on two sides (our rooms were on the corners of two floors).

I was angry at the taxi drivers, at the hotel, and at our tour guide for all this and couldn't go to sleep. I finally hauled the mattress off onto the floor (much better), wadded up my overcoat for a pillow, and stifled my anger and drifted off.

In morning things looked slightly brighter. A continental breakfast and a walk around town helped. Later we visited the Natural History Museum, ate camarones for lunch, had a couple of harrowing taxi drives, checked plane reservations and Bolivian visas and reservations to Cuzco, shopped in busy Lima, ate a nice leisurely dinner atop the hotel and had our rooms changed to some up on the 9th floor above the noise and with good beds. All is peaceful again and Lima seems O.K. and even interesting.

July 2, 1968

Lima, Peru

We arose a bit late today because so much time was spent last night reading to each other (*Voyage of the Beagle*) that we didn't get to bed until late.

A little morning walk took us to the Plaza San Martin so we stopped for breakfast at the spiffy Hotel Bolivar. The kids even liked it because we located pancakes on the menu. Afterward tickets were straightened out at LAN for the Cuzco flight and we went to the Bolivian Embassy for a circuitous 20-sole taxi ride that brought us within a block or so of where we left. As the desk clerk in our hotel says "Peruvians are muy vivo."

We did need visas in spite of everything and emerged with them and a sheaf of lurid travel folders. We all poked in the shops for a while. The kids fell in love with the alpaca fur rugs as I knew they would. Everyone was tired so we retreated to the hotel for a slim lurch of soup. Phylly, Barb, and I left the rest in the hotel and went off to the archaeological museum. We found it a very interesting collection, especially of pottery, cloth, and burial sites. Afterward we shopped a bit and came back to find Dick clean from a nice bath and everyone relaxed and happy.

For dinner we located a place with real barbecued chicken and chocolate cake! Wow, a social success.

A word about Lima. It is frenetically busy. People pour up and down the sidewalks. Most are neatly dressed, but as in all these South American towns there is a compliment of beggars—the poverty is not so evident as one might expect until one enters the barrios of the outskirts—great sprawling shanty towns.

Traffic rushes and cars miss people by inches at terrifying velocities, both driver and pedestrian judging perfectly. Taxis are everywhere and cheap (20 soles for an 8-mile trip—40 cents). Many are incredible rattletraps with flapping fenders and hoods, cracked windshields, and smoky motors that bid fair to quit any crucial time. Everybody honks, jabbers, etc. There are endless jewelry stores and unseemly numbers of clocks for sale. Che Guevara is feted in books everywhere, as in a series of books on the power of American dollars, taxi drivers want to know what we think about the assassination of Robert Kennedy—we see writings from before his death extolling him as the hope of South America. No one knows the others, except Johnson. They doubt that he has been good.

The scene is the same in Mexico City, which could be a carbon copy of Lima—both old, both full of history and conquest, full of new, glassy skyscrapers and both full of ferment, of poverty, of crowding people, of cosmopolitan attitudes, of cruelty I suspect, and both beautiful in their way.

Tomorrow to Callao to the Instituta de Marina.

July 3, 1968

Up early and propping up sleepy children. After a continental breakfast in the lobby we caught a cab for the Instituto de Marina in Callao, where I met the director, Dr. Jorge Sanchez, a specialist in population dynamics and a very gracious man. His English was worse than my Spanish, believe it or not, so we conversed in Spanish. Soon he referred me to his cetacean specialist, Dr. Jorge Mejia, a biologist who has worked at whale tagging, especially the Chicalote, with Robert Clarke of the National Institute of Oceanography in England. He told me that next to nothing is known of the porpoises of Chile, Peru, or Ecuador. What is known comes from old literature based on very few specimens or dubious modern identifications. Clarke had really done nothing on the small cetaceans. His identifications are not based on analysis. Mejia told me about sighting of various cetacean species, and most interesting, that perhaps 1,000 *Phocoena spinipinnis* (harbor porpoise) are caught every year in Peru for food nearshore in Paita, Chianlote, and Callao. They are netted but he did not know how. *Tursiops* is likewise caught for food. The Paita station is the only functioning whaling station in Peru and it is rented to a Japanese firm who freeze the meat of the fin whale for food and render blubber for oil.

They work from November to about May and catch largely blue, humpback, and fin whales though he mentioned the sei whale too.

Fin whale—ballena de aleta

Humpback—ballena jorobada

Sei—ballena boba

I question this identification of the sei whale here and wonder if it could be Bryde's whale (*B. edonii*). Also, Clarke talks about *Lagenorhynchus ornages* here which I suspect.

I arranged to have some workers to collect for me at 4 places along the coast and for us to return in September to pick up specimens.

I also talked to the very nice lady ichthyologist, Norma Chirichigno, who seems very competent. She showed me some very strange angler fish from the stomachs of sperm whales.

Meanwhile the family walked with Phylly and a secretary around the beach of cobbles at La Punta where the Instituto is located.

The harbor at Callao has a staggering number of purse seiners. I never saw so many—hundreds. They fish a 52-day season for anchovies and still are fishing the species out of existence. Callao itself is nondescript. I am told the stretch of open country between it and Lima has all but filled in the last ten years. Growth is explosive. Enroute we passed some great sprawling barrios—compounds of adobe huts with tile roofs, dirt floors, and no facilities—containing perhaps 500-700 people or more. These people are pretty hopeless and on the verge of starvation. Little economic changes could eliminate them.

After a rest which turned into a boxing match between me and Ricardo (I relatively unwilling), we went shopping. The girls took me out to get some alpaca bedroom slippers. Finally I found a pair large enough for me, much to everyone's joy. Then we ate a nice steak dinner and came back to the hotel to sleep. We get up at 5:00 AM to go to Cuzco.

July 4, 1968

Cuzco, Peru

All Norrises arose at the horrendous hour of 5:00 AM, trundled sleepily down the elevator with all our damn baggage, hustled ourselves into two cabs and headed for the airport in the dull dawn. I was staggered by some of the huge *barriadas* we passed—great adobe-walled compounds stretching for a mile or more in some dimensions and teeming with people.

Getting on the plane was a pretty typical hassle. Our LANSA flight was moved from 8:00 AM to 11 AM and we were moved to Faucett Airlines leaving at 7:50. No one would take my overweight baggage *chit* so I had to pay about \$20.00 to get our junk to Cuzco. What a milestone. For all this my breakfast was interrupted twice. Unluckily we did not get window seats. As the plane rose it pierced the perennial Lima haze and out into the bright sunshine. The flight cut diagonally across Peru to the SE. It is extremely rugged terrain, very barren, cut by deep canyons that sweep more or less directly to the sea. Downcutting is rapid as streams swing back and forth across broad alluvial beds. Trees are very sparse—even brush is scarce. Even so, I could see marks of tilled walled fields on incredibly steep hillsides, some obviously just old traces. As we neared Cuzco,

the mountains became higher, occasional chaparral-like patches occupied canyons and north slopes, the multitude of spiderweb trails of grazing animals laced over the mountains. Small clusters of tan adobes could be seen in the verdure along streamcourses and on adjacent hillslopes intricate terraced gardens, all without roads and certainly only in communication with the outside world by horseback or foot. Here the language is ancient Inca or Quechua, not spanish.

I turned across to Phylly and found her marvelling at a very different landscape on her side of the plane—immaculate white peaks, incredibly rugged, with thin clouds blowing in streamers past their peaks. Some were even higher than the plane, especially as we began our descent into Cuzco. Soon we cruised over the tiled rooftops of the town. It is set amid barren, rather rounded hills with patches of grain growing on the most unlikely slopes. One could see the domes and crosses of several churches and the winding narrow cobble streets. The airport is new and bright and one could feel a friendliness from the people so rare in Lima. People are much more without reserve. Pleasant, as I'm no city slicker. A brisk young fellow took us in tow, arranged to get our baggage in order, got two cabs (one his), and off we went to Cuzco. His name is Ferdinand Pinares Cuadros and his card declares him to be a "student". He is in law school and learning english. The latter is good. I hired him to take us on a tour tomorrow after we have had time to adjust to the altitude.

The hotel is in a great old stuccoed building in the heart of Cuzco—all adzed beams and overhanging tile roofs. Indians in their truly unusual clothes walked the stone sidewalks on all sides and traffic, I am glad to say, is light and most of that people, carts, little austin-sized men carrying huge loads on their backs, school kids, politicos, policemen, beggars, and little bitty kids.

We stashed the family in our two adjoining rooms and Phylly and I went out for a walk. The City of the Sun, the ancient Inca capital, is quaint and filled with interesting sights. Many Inca walls are part of buildings, some like the baroque church on one of the main squares. It is amazingly precise—blocks without mortar fitting together with great precision. The streets, too, are formed of smooth stone blocks built with great care. Phylly and I poked into all kinds of stores, asked questions about potatoes, cheese, cloth, television stations, and endless other things. I have learned to explain that I am just a curious tourist in a new and strange world and this usually brings a smile and a cordial response.

Back at the hotel we found the kids pretty well flattened by the altitude and fortunately we had left a day for high-altitude acclimation. Dick, however, was bouncy so he and I went out for a walk. We soon found ourselves in a huge indian market winding down street after street with stalls, a covered mercado, and hundreds of indians with their wares spread on clothes on the street. Everything imaginable seemed there—whole streets for fruits, an alleyway for making shoes out of truck tires, dye merchants, indian shish kabob merchants or at least their indian equivalent, cooking spitted meat and vegetables over little hand made grills fired by pieces of charcoal—also deep fried little doughy sweet meats in little carts.

We watched women spinning wool thread with little weighted spindles which they spun and dropped, pulling the wool with one hand to assume evenness. Later when the thread piled up it was held by bare toes and wound off. I asked one gold toothed indian lady squatting in the center of the street if I could take some pictures. Immediately

she wanted money. I offered 5 soles and she held out for 10. Finally I gave in, much to the delight of the surrounding gaggle of ladies—most a bit envious at their friend's windfall. I took quite a few pictures amid general palaver when my spinner's meter ran out and she demanded 20 soles for any more photos. Dick and I left amid general laughter. How would anyone pay 10 soles (20 cents) to take pictures of anyone spinning for heaven's sake?

One indian momma whisked her child away when she thought I was going to get a free photo (got many by adjusting distance and exposure first against a wall or somesuch and then snapping surreptitiously as I walked. Most women carry either a child on their back in a wool poncho or shawl tied around their neck or goods of one sort or another. They wear brightly colored shirts and sometimes sandals. Most have braided black hair. Some nurse babies as they barter. Mothers in their early teens, I would guess, are not uncommon.

We walked back slowly, allowing for the altitude (about 11,100 ft.). Later I took Phyl on the same route and we picked up a poncho for Leslie Hinton, woven of wool by hand. Aside from their obvious universal tendency to exploit the tourist these people are relatively close to their old ways though goods from the urban world finds its way into many crannies of their lives.

Phyl and I watched a magician pulling 5 sole notes from a bag surrounded by 50 indians. The keen interest and finally true amazement on their faces was a hint to their strong "country folk" attitudes. They all laughed uproariously when the little boy pulled nothing but shredded paper where the sole note was supposed to be.

A lovely dinner of Lake Titicaca rainbow trout with local champagne (we freeloaded on someone, we think) followed. Even the kids except Barbara who slept, found something good to eat. Tomorrow a taxi tour of archaeological items in the morning and getting tickets for the Machupichu train and to Puno. All's well and we hope the kids will acclimate by tomorrow. Happy Independence Day!

July 5, 1968
Cuzco, Peru

Ferdinand was waiting for us, in a light drizzle, at 9:00 AM to go out among the ruins. Some rounding up of children was necessary, but we made it about 9:30 and set out southeast of town on a good graded road that is apparently typical of the main mountain roads in Peru. Our road wound up above Cuzco to over 12,000 ft. and we ended at the old spring of Tambomachay. It flows through a pre-Inca rest house, out 2 stone spouts and into a little rill. Pre-Inca is differentiated from Inca because the stone blocks are polygonal rather than square. The sides do indeed fit with no mortar so closely that no knife can be slipped in anywhere. The walls slope from the vertical in such a way that they are very stable. Periodic reentrant openings were apparently placed to compensate for the motion of earthquakes. It was cold and the kids shivered as we walked around. Ferdinand is a very well-educated mestizo (spanish and Inca indian), studying to be a lawyer so he can work for land reform among the indians.

He knew a great deal of Peruvian history and the modern indian. He was practicing law by representing his fellow taxi drivers. He showed us how the watching posts were set, line-of-sight, on hilltops so messages could flash by eye. Down the hill we visited a fort called Pircara and then stopped at Kenco, a very strange amphitheatre-

like structure. A half circular wall about 5½ ft. high circles around a square altar of cubical stones. In the center of the altar is a large rock, supposed to be a god. Around behind we came to a honeymoon house for the ruling class people (workers had trial marriages). (This is contradicted by Bushnell.) In it was an uncomfortable looking stone bed, an altar for animal sacrifices and a shaft that admitted sun two hours per day. The couple stayed for a 6-day week.

On down the hill we visited the great fortress of Sacsayhuaman. Its zig-zag walls contain boulders weighing many tons and perfectly fitted. Behind are two more walls that encircle a knoll. Ferdinand described a modern fiesta to the Inca gods that on June 28 brought 150,000 people to this spot—so many he said rocks could not be seen. This fiesta was one where indians could mix with whites since the whites were, in effect, paying homage to an Inca god.

Ferdinand classed himself as white—though a dark-skinned mestizo. He said when he suggested he wanted to help indians obtain land, they turned him away saying, “Why do you, a white man, want to help us? Go help the white man.” Ferdinand said he had 40-odd indian children in a very poor village near Písnj, plus 4 of his own. This, he said, had held him back somewhat in schooling, but that he would graduate in a year. The idea that land was held by big owners with indians as share croppers he recognized as wrong, but the notion that subdivision into plots too tiny to work efficiently is bad, had never entered his head. I asked if he knew about cooperativas in which many people pool their resources, as is often done in Mexico. He did not but listened. He seemed surprised that I felt negro ferment in America was pointed in a good direction and that I didn’t think democracy was much good for his indians. The socialist Inca state seemed to appeal to Ferdinand. I suspect he dreams of bringing them to some sort of dignity and perhaps glory again. On the seat lay a copy of *The House of Seven Gables*, which he was reading for english class.

At one point he showed me a hammer and sickle chalked on an Inca wall. As if to still my fears, he explained that South American communism was not other communism—after all, how could that be with 60% of the communists catholics? He viewed the catholic church as a great enemy of his indians—taking their last sole when they have so very little. He explained that Indian catholicism was a bit strange too, since they maintained 4 or more gods in addition to the catholic one. With each meal they spilled a little on the soil as an offering to the water and soil gods from whence their food sprang.

I asked about health, birth, and hospitalization amongst the indians. Hospitals, he explained, were for mestizos and whites. Indians bore at home, helped perhaps by a midwife. The baby was then summarily dunked in a stream. If it moved it would be tough, but many, perhaps most, died. A witch ministered to sickness and many herbs and potions were used, but never the hospitals. Their food was relatively varied—wheat, maize, potatoes, some meat, fruit, etc. Peppers were important since prehistory.

We arranged tickets to Puno and Machu Picchu, a very complicated affair involving telegrams to Puno to get another compartment attached to the train.

Later Phylly and Dick and I walked around town looking at the ancient churches, walls, shops, people, and so on. At one point Phylly thought we had located the sacred inca temple of the sun, which is now the foundation of a Dominican church (there are 23 catholic churches in Cuzco). A fine-looking old spanish man walked up and asked if I

spoke Castellano. I said, “a little.” He went on to show us at the base of the great curved wall, which was indeed the temple of the sun, some little knobs and pits in the otherwise perfect blocks.

These “pechos” he explained were to accommodate the end of a crowbar when the stones were prized into place. He explained more about how the contours and thicknesses of stones were maintained. The wall was indeed fit for a temple of the sun (that of the headman, or Inca)—perfectly fitting, perfectly rounded and smooth and blocks of amazingly uniform size—all utterly without mortar.

Back through the slight rain we went arriving very cold at the hotel. Dinner and to bed. Up at 5:30 tomorrow for the train trip to Machu Picchu.

July 6, 1968

Machu Picchu, Peru

First thing this morning I looked outside and it was snowing. Later in the morning it was splashed over the newspaper. “Cuzco Nevada!” It was unheard of at this season. Some said it was the first snow in a century. Anyway, we trooped in to breakfast while Nancy took it easy upstairs with our first sickness—a tummy ache which we treated. By the time we went upstairs for our bags she was better and ready to go. Everyone tumbled into a cab even though it was just about 5 blocks. The station was a bustling mass of indians and tourists and railroad functionaries. The second class train typically left on time, crowded to the guards, while first class remained behind in some sort of administrative tangle. We finally embarked on a single view dome diesel car, all frosted with cold and the dome gray with snow. Up through the adobe and tile or tin-roofed hut section of town we went, everything turned white and fading into indistinct forms in the swirling snow. The ubiquitous eucalyptus, Cuzco’s most abundant trees, were bent down like birches, phone wires arced low, made 20 times larger by a sausage of snow. We backed and went forward, backed and went forward, over the crest of a 12,000+ ft. grade and down into the drainage of the Urubamba River, which in turn drains into the Ucayali and thence into the Amazon.

The snow was deep enough that cars and trucks were being stuck on the road paralleling the track and was still falling fast. We crept along and various adventures combined to make our trip 6 hrs. long instead of the predicted 3 hrs. First just snow, then assorted small rock slides, then a grand $\frac{3}{4}$ hr. stay while the road crew cut away about 100 yards worth of eucalyptus saplings that had bent across the tracks. A stocky little porter hauled out a wooden case and plunked it down in the aisle. It proved full of goodies such as chocolate bars, cookies, cheese, and the like, all available at astronomical prices. I tapped for two bars of milk chocolate, which by this time were greedily consumed by all hands.

At each little village the train stopped while various inexplicable things were done. Indian kids in bare feet paddled around unconcernedly in the snow. Shoes (sandals really) obviously made their feet cold as some held them while walking barefoot in the snow. We were objects of great curiosity with some little children just staring deadpan and half frightened at us, without a smile. Nancy, who was feeling good, was able to elicit a few smiles though.

The countryside is barren—rocky snow-clad hills ridged with animal trails, austere little adobes, wobegone stock standing silently with snow on their backs, thin

rows of eucalyptus and a few cedars and little patchwork fields of maize and potatoes on the slopes.

After a while the snow began to thin as the tracks led us into the river valley. The canyon walls soon became precipitous, even overhanging in a few places—heavily vegetated with aloes and brush. Finally the snow was left behind. The canyon now rose some thousands of feet above us to snow-clad crests. The river rushed and roared over granite boulders. Our train clicked along not far above, periodically ducking through little tunnels. Many times I wondered if the snow above might not loosen really substantial slides down the almost vertical walls. Far above snow storms whipped around rugged white peaks, many of whose slopes were terraced with Inca terrace gardens.

Streamside vegetation became dense—beautiful red-flowered trees like coral trees were everywhere, as were wild begonias, tiers of ferns including some of small tree size, bromeliads in many trees, even orchids. A peculiar crawling bamboo draped itself like green feather boas from trees along the riverside. In one bend of the canyon we looked above us and saw a great Andean condor circling. Later I saw five more very high in the air, circling.

Finally the train arrived at the little station and suspension bridge that leads to the Inca ruin. A group of small buses were busy ferrying people up and down a switchback road that rose right up a very steep slope to the hotel and the ancient city. The hotel itself is built on the midden of the old city and is perched on a cliff 1,400 ft. above the Urutamba River, rushing below. The scene is almost indescribably rugged. Upstream sheer granite cliffs plunge very near the vertical into the canyon from points above the river. Across the stream sheer peaks rise far above the level of the ruin. Downstream a [?] of jagged scenery ends with a backdrop of pure white Andean crests. If one tries to see from whence he came it looks utterly impossible for a train to have traversed the mountain.

The Urubamba upstream seems to follow clefts in impossibly rugged mountains essentially impassable to man let alone a train. Above it all rises the white crest of Veronica, a mighty Andean peak some dozens of miles away and 17,000+ ft. Alpacas walked leisurely down the road in front of us as we unloaded at the hotel and checked in.

Soon we began the hike to the nearby ruin. It too, defies description, set as it is, on a ridge that drops vertically on either side 1,000 ft. or more into the Urutamba. At the end of the spur on which the town is built there rises a subsidiary peak to a precipitous dome. It is sobering to see terraced gardens near its crest where a misstep could send one flying a 1,000 ft. into space. I suspect that Machu Picchu was a comfortable town, probably with more conveniences than the present Hotel, in its way. The present hotel is an outpost, the ancient town was a magnificently executed and complete city. Great stepped garden terraces rise a thousand ft. on one slope, houses are tightly made of stones with sharply peaked roofs, magnificent temples, what may be a stadium, an ingenious water system in which water was led in precise grooves cut in granite from pool to pool, often through rocks or under them. The precision of the stone work, here with granite, is perfectly precise in the temples—ranges of cut stones form perfect lines many yards long.

In houses long stones with an eye hole cut through one end were embedded in the walls to serve as tie points for the roofing. Cylindrical rocks projected at regular intervals to take rafters, and in some temples large clefts, precisely made, could take huge roof beams.

We hiked until tired, returned to the hotel, ate dinner, and admired the alpacas, including a couple of grand ½ grown babies—all camped on the front steps of the hotel.

July 7, 1968

Cuzco, Peru

Before the rest woke up I walked out of our little hotel (it takes 35 people) and walked out on the terrace overlooking the Urubamba. The sun sent shafts slanting into the deep greenish blue of the canyons and lighted the peaks whose summits glistened with snow. Deep in the canyons all was dark and must remain so most of the day.

After breakfast we explored this amazing ruin again, this time hiking up to a burial area at the very top of the ruin. We were amazed all over again at the consummate craftsmanship of the place. Irrigation water was led through grooved granite blocks to all the fields. At the top was another freeform altar supposed by some to be involved in burial. Several large terraces occupied the upper ridge, being held in place by terrace walls set on precipitous slopes so steep it gives me vertigo thinking about them. Just below these retaining walls was a free drop of 1,000 ft. or more.

Along the wall of one of these terraces entered the Inca road that connected this town to others in the Inca empire. It led up through a notch on the ridge above Machu Picchu. We could see stone steps and some sort of monument in the far away notch. The road was part of a 2,000 mile system on which teams of runners bore messages and even fresh fish for as much as 150 miles a day.

The order of the day was the collection of pieces of serpentine which Nancy insisted on calling travertine no matter how many times we told her. When I got back to the hotel I cut a design like an idol on one piece and sat in the sun on the porch scratching away at it. Before long one of the waiters came up and looked over my shoulder. He developed a worried look and wanted to know where I had gotten the rock. In the ruins, I told him, continuing to chip away. He was horrified to think that I was defacing an artifact. I explained that I had made it. Somewhat mollified he wanted to know where my model had come from, as the design was clearly Chimu, the oldest culture in Peru. No, I said, it was “Los Angeles Culture, early Mack Sennett stage, showing an early movie director with hole trephined in his head, because of the empty material he worked with.” Needless to say, all this impressed him but went over his head a few meters.

Anyway we decided it would be easy to get 500 soles for the masterpiece. All this activity so stirred the kids that we went off on a combination alpaca and travertine (oops serpentine) hunt. The alpacas grazed up and down the precipitous switchback road to the hotel. When we saw the alpacas about halfway down the 6th switchback we turned back.

Shortly the autobus loaded up and we raced at near breakneck speed down the road. Soon we were on the way back with a noisy load of school kids from the east coast—Boston, New York, etc. Nancy ended up pretty car sick so we were all happy to get back in the cold dusk at Cuzco. The short walk to the hotel helped there, however, we were greeted with no room. A Sierra Club group had come in after being stranded in the rain and snow for 2 days and had commandeered all available rooms. I explained that we had reservations, etc. Finally the management came through with the presidential suite for the Sierra Club leaders, moved some reluctant lady hikers out of our room and in we went. Nancy quickly went to sleep while the rest of us went down to dinner. Oh joy!

I found that we could order plain rice with butter. Children of most dimensions rejoiced at this familiar fare, and had one of their best meals in days and days.

A word about Peruvian pillows. They are awful creations—like long, flat sausages packed with some uncompressible material. One's head gets propped up at untenable angles. At Machu Picchu, praises be, all had fluffy America pillows and slept like logs. I hope a decent version is available in Chile.

Once the kids were tucked in, Phyl and I droppd by the bar for a couple Pisco Sours and thence off to bed for early rising tomorrow on our way to Puno.

July 8, 1968

Puno, Peru

Another predawn awakening, and breakfast with half-anesthitized kids. We had a lunch packed in case there was no food on the train. The taxi driver who was to take me to the train didn't show in enough time so I hailed a couple and had our luggage loaded in. It was mildly complicated at the station as my book box was too heavy to load into the buffet car and had to get it aboard the baggage car. One tends to accumulate as many porters as you will allow I have found—we ended up with 3 who heaved all our goodies into the car and left with the majority of my small bills (each worth 10 cents or so).

Our car had our family and a very pleasant 4H club group who were on a sort of "experiment in international living", and would end up on farms all over Peru. They were a lively and extremely friendly, personable group.

The train was equipped with a couple of stewards who plied us with soft drinks and later food. Phyl and I liked it but the kids, as usual, found rather little to please them.

From Cuzco we ascended the Milcanota River valley toward a summit at about 14,500 ft. The valley was dotted with little adobe towns, all tile roofed, serving the surrounding farmlands. Farm plots extended nearly to the crests of some hills. We saw mostly corn and wheat or barley. The eucalyptus was the most common tree though stunted pepper trees were common and occasional slopes were covered with brush. The cedar is also cultivated though most wood is eucalyptus. At the higher locations even this was gone and ties for instance were steel and cement.

The snow line dropped as we ascended the valley. In schoolyards melting snowmen more and more often stood. Interesting that this was supposed to be the first snowfall in 100 years and yet the snowmen sprung up as if ordained.

Cattle and sheep predominated and scarcely a llama or alpaca was seen at the low altitudtes, but as we approached the pass the cameloids appeared in huge flocks grazing on the bunchgrass-covered alteplano.

Once we reached the altiplano the canyon walls dropped away and mountains were usually rather low and often distant. The usual scene was of yellow grassy llanos, cut here and there by meandering streams, revealing red soil in the cliff banks, while a mile to ten miles away, low mountains, crested with snow, rose in barren peaks. The flocks were tended by groups of two or three indians, dressed in shawls, bowler hats, full dresses, sandals, or more often none, and often dropping a spindle as they walked along spinning llama or alpaca wool thread. They were often miles from the nearest adobe. Instead of garden plots there were stone corrals for the flocks.

Passing villages gave us glimpses of life in this treeless land—a soccer game well attended, uniformed children goose stepping on parade, tiny men with huge burdens (no

tump lines or head bands here, only a rope slung around the load and then over the shoulders to a simple knot held tightly with both hands). At some stations we had time to get off and bargain with the local folk who had their oddments spread on the station platform. At one of these the 4H clubbers ran into some pottery of men and women in graphic attitudes which the indian lady calld a “matrimonio” and they came back tittering. Later one girl was bargaining for a shawl with an indian and offered more than the lady asked. This caused general hilarity by all

Our most exciting moment, however, came at Juliaca, some 48 kilometers out of Puno. We had a ½ hour and as I wandered back to the platform after about 15 minutes the train gave a chuff and started off down the tracks. Dick, Barb, Susie, and I ran for the platform of our car (Nancy was inside already). Susie got aboard and so did I. I had to pull Barbie up and Dick clambered onto the steps of an adjacent car. Phylly stood back amid a group of indians and others from the train impassively watching all this. The trains, as can be imagined, was doing some complicated switching and came back again.

Soon we began to see marshland and in the early evening light the silhouettes of reed boats at anchor on the shining water. I didn't have time to watch however, but had to assemble all our baggage preparatory to getting it off the train at Puno. What a pile of stuff. The biggest box, including all my papers was, of course, back in the baggage car.

We pulled into Puno—all low adobe buildings, indians, dirt and swarming porters. Phylly and the kids went ahead with their hand luggage while I wrassled with the bigger pieces. I commandeered two porters and soon we had most of our gear piled on the dock with Phylly tryig to count it, amidst 150 people in the dark, while keeping track of kids. She finally realized that we were missing one piece so I went back and found it. Porters were screaming and grabbing at our luggage when I returned. Our two headed for a taxi while I stood guard on the remainder of the suitcases. They began to quarrel about who should help and I actually had to beat them off. Two tugged in opposite directions on our big suitcase. Finally our men returned and we took the rest to one big cab and piled it on the roof in the back, etc. Meanwhile the train had gone off somewhere with the big trunk. I gathered it would be back so raced back to the cab, paid off various people, including one to run along behind to watch the open turtle-back stuffed with luggage.

The hotel proved to be about 2 blocks away (25 soles or 75 cents for the ride). I stashed all the luggage and family, checked in, and headed back for the train station with my two porters to find the book trunk. Once on the platform there was not a train in sight but very quickly it backed in. I looked for Buffet Car 29 as the porter had my receipt for the trunk. Praises be, he had loaded it on the buffet car and we quickly hauled it off. The darned thing weighs about 150 lbs. but one man hoisted it on his back and started off for the hotel. I had expected to hire a taxi but instead had hired a pair of men. I walked along behind feeling embarrassed.

They were glad to plunk it down at the hotel, and so was I, giving them 25 more soles for their aching backs. Phew! All our luggage and all people in order and nothing lost or stolen.

The Hotel is a rather sparse affair but the bastion of culture here in Puno. No purified water, all boiled in pitchers in the rooms and only a little electric heater per room. It's very cold here and we were delighted indeed when our houseboy showed up with steaming hot water bottles all around. All of us still joggling from the train ride, we

had dinner, went directly to bed, tired and happy to be intact and in good beds (alas with Peruvian pillows).

July 9, 1968

Puno, Peru

We all slept in till 8:30, ate breakfast and took a walk around town, rapidly finding ourselves in a big mercado. Nancy and Susie hadn't yet seen one so it was interesting to them, especially to see all the heaps of foods and goods, the barter, the nursing mothers, the spinners, and all the rest. We bought some tangerines at Nancy's insistence which I rationed in halves to keep people from getting belly aches.

Later we visited the Cuerpo de Paz to find out if there is a Lake Titicaca biology station. There is, and it is concerned with the trout hatchery. A young fellow named Jim told of his work on a experimental farm on the forest slope of Peru and at Puno. He took us shopping for alpaca sweaters and socks. Most everyone is equipped for the cold of Tierra del Fuego and, for that matter, Vina del Mar!

Later, Phylly and I left the kids and went for a walk after we earlier had visited the dock where the steamer ties up. It takes a overnight trip to the port in Bolivia where transportation into La Paz is easy. It's a pretty good-sized ship (125 ft.) for this lake and was, we are told, fabricated in Puno.

Dinner and to bed. Tomorrow we visit the hatchery or go out to the peninsula for an outing.

July 11, 1968

Puno, Peru

This morning at breakfast we were met by a young fellow named Jerry who is a Peace Corpsman from North Dakota here working in the trout hatchery near Puno. He told us about the problems of his operation—basically poaching. Not only are fish caught out of season but his planted fish are taken out of the streams with throw nets. He also mentioned the problems of working with Peruvians of different political extractions. In the lake he told us is a species swarm of cyprinodonts of the genus *Orestias*, an introduced atherimid that looks a great deal like a top smelt, the Peze Rey (from Argentina), the rainbow trout, and a pyginiid catfish. All are used for food. He knew about the frog *Telmatobus*, but had seen only one caught in a gill net. He thought it was typical of deep water. Since there were no frogs to be seen at the hatchery I decided we would go out to the Uno India village instead of to the hatchery.

Accordingly we rented a launch and an operator named Adolpho. We were joined by a pleasant young german named George Zimmer from Stuttgart. He spoke good english and was an instructor of deaf and dumb children.

We pushed off past the moored steamer that goes across the lake, and headed toward the balsa, or marshland. Many birds could be seen amongst the reeds, including many coots, grebes, and seagulls. Some of the coots were seen displaying. They puffed their feathers and raised their wings and tail. A bright white patch shone above the tail of the displaying pair. Soon the reeds closed in on us and we found ourselves in a channel. The water was shallow and clear as glass. Most of the bottom was covered by 2 or 3 species of water plants. Very few fish were seen. Apparently only the cyprinodont is common here. The day was calm and sunny but chilly in any shadow. We wound

around in the channel, with only Adolpho knowing where we were going. A couple of balsas were passed. They poked in the reeds here and there. I asked Adolpho what they were doing and he replied that they were searching for pato eggs (duck or mudhen) and working bird traps.

We came across some men cutting and bunching reeds for new balsas or reed boats. These are nicely built craft composed of two main bundles of reeds forming the hull and two smaller bundles of the sideboards. All are laced together. Most were poled along, with indian ladies in derby hats and full dresses either sitting in the back or poling their own balsa.

Before long a silver roof could be seen over the reeds. This turned out to be a floating schoolhouse donated by the Seventh Day Adventists. It consisted of a shed on about 20 oil barrels moored at the edge of a dense mound of reeds. On this same mound of reeds were the matting houses of the Uros and most of the population of about 50 souls. They live entirely in these reeds with no solid ground at all. One must be very careful not to fall through soft areas into the 51 degree water below. So far as I could see they looked like the other indians though they speak an ancient language not allied to Quechua and some members are said never to have been to Puno.

As we came up a hot soccer game was going on on a broad patch of reeds and the major goal seemed to be to keep the ball dry.

The moment we landed we were swarmed around by a dozen broadfaced, black-eyed little children. Some held out model balsas (for 5 soles). One held out his little hand for us to put money in.

Another led a little squealing piglet around on a leash. Pots were steaming on little charcoal fires up on mounds of reeds. I suppose the reeds didn't burn as they were too moist.

I had a grand time with the kids and got most of them to tell me their names or tell other's names to me—which was a big joke. We laughed and laughed at Tlak Tlak Tlak. I asked Adolpho what they ate and he told me food from the shore—bird's eggs, trapped birds, fish, and such. I thought they looked well and much healthier than most indians on shore. There seem no insects about, or at least we noticed none. All in all they were a happier lot than most we have met.

On the way back the kids caught reeds and trailed them in the water. I looked for frogs but saw none. We arrived back at 1:00 PM, sunburnt and tired. Later Susie and Dick and I walked through Puno to mail some letters. We came upon the museum and marvelled at the mummy with at least 6 trephined holes in its skull. Then we dropped in a weaving factory where indian girls and boys sat weaving alpaca yarn rugs. Great old wooden ceiling-to-floor looms had two or three people working apiece, seated on benches. The warp was lifted up with a wooden stick and yarn sipped through. An instant [?] knot was tied and the yarn clipped—all so fast we could not make out how it was done. A three-meter long rug with a design of Tiahuanaco style sold for about 4,000 soles (\$100) and took a month to make.

Back at the hotel we made arrangements for an early morning departure for La Paz. It looks like more baggage problems as the tour has grown to 25 persons they think and there may be too little space. We may have to rent a car for about 700 soles to haul the stuff to Copacabana. It will be worth its weight in gold by the time we arrive at Renaca.

A word about the indians here. They are Inca descendants of not such long lineage. In the 1500s they had an intricate society—a theocracy, magnificent artisanship, a technology really, unparalleled in this hemisphere and in many ways the superior of Europe's at that time. Now they are degraded to low-level serfs on large ranches, or marginal farmers on poor sloping land. They are the beggars, the tattered (incredibly so, often) porter of incredible burdens, the dirty and suspicious. It is worth pondering that social circumstances can so change the lives of a people, and can so change the ways they make their livings or compete. They are on the downswing of the pendulum and we on the up—but it could be the opposite easily enough.

July 11, 1968

La Paz, Bolivia

Well, we didn't have to rent a car as only 21 takers showed up and we had luggage space to spare, even with our enormous pile.

We were hustled into 5 cars with drivers and started off by land to circumnavigate the Peruvian border of Lake Titicaca. From what I could gather the border between Peru and Bolivia across the lake caused some problems as well as rough water. At any rate more than ½ the trip was by land. We had never been on an organized tour before and didn't quite know how to act when all 21 of us were led down up [?] some balsa boatmakers by the shore. The tour guide, an efficient, aquiline-featured Bolivian girl named Maria Elena got them to pose at work and everybody clicked away. The indians had obviously been prepaid by the Crillon tours. Back in the cars we continued through the austere landscape of the altiplano—every inch, clear to the top of most mountains, is terraced with stone walls. All fields were barren and brown, or simply stones and dirt. The large flocks of stock graze it to a nubbin. Erosion is a prominent feature. Dotted everywhere are tiny plastered or painted adobes, and indian ladies in derbies, spinning as they walk. Many spin the spindle and let it spin its tip in the ground like a top.

Three or four times we had to stop for various officials to check our papers. Our worst one was at the cavalry headquarters where a very fancy looking guard demanded our passports before lifting the iron gate across the road. Since our tour guide up ahead had our papers it seemed like an impasse but some rapid spanish by our driver solved the problem somehow. Up the hill was a little village spread on the slopes around a huge red sandstone church. This, we were informed, was the most beautiful colonial church on the altiplano and had once been central in the spanish administration of the area. The stone came from local beds, tilted into great fins and minarets nearby.

A wake was in progress—or at least nearly over as the women were sitting in a huddle at one side of the churchyard, in their black derbies and shawls and skirts, while the men were gathered standing, also in black, at the other side of the yard. The women, we were informed, were chewing coca leaves (from which cocaine is derived) while the men drank straight alcohol out of tiny little, long-necked greenish bottles.

We trooped inside the great church, passing by the stone belfry with its ancient stones sprouting little bushes of plants and its huge bronze bells hung on hoary old logs. The façade on the door is carved of sandstone into baroque complexity. One can see indian faces in the carving here and there. Inside the great vaulted roof of square stones ran to the transept and apse with its fantastic gold encrusted altar running from floor to ceiling. A yellowish light shone through alabaster windows in the dome, said to have

been brought from Spain. Everywhere were wooden painted santos and old paintings of saints or the crucifixion. An ark of glass and gold contained the bones of some important soul. A few votary candles flickered.

All in all a monument to the power of this church, with its mystery and various ways of subjecting its subjects as wholly subservient to it. How else could an indian feel facing that altar?

On we went, through the dusty rocky streets of the town, between adobe walls, past goats, indians, pigs, wagons, bicycles with glass boxes full of bread on the front and out again into the barren altiplano. Soon the lake came into view again as we approached its southwestern corner and the Bolivian border.

There is uncertainty in somebody's mind about that border as there were 7 (count 'em) stops involved and I never did find out which one was supposed to be the real McCoy. Heaven help the tourist driving this road. He'd be stuck for hours or even days trying to figure it out. We had our papers cleared at the plaza of a little town a couple of kilometers back of the most important looking border. While all this was going on I poked in various shops looking for some line to tie my camera box on the cab's top rack. The cab driver insisted it was safe but with \$1,500 worth of important camera gear in it and these bumpy roads I refused to take his word. In every store was a bale of coca leaves. I found that each indian lady has a special little cloth in which she wraps her daily ration of leaves for chewing. Thus nearly all indians are to some extent, addicts.

Soon we came down from some rocky hills to the quaint little town of Copacabana. It sits up in a cove of Lake Titicaca and is dominated by a huge church which is also a shrine. The building has an almost moorish look with blue and rust-colored tiles on roof and domes. Near the door sat indians selling candles and another group singing peculiar plaintive reedy songs led by a blind indian playing an ancient violin.

Inside we viewed another baroque altar and the shrine in a little chapel above. This one was all silver and mirrors. I felt out of place and was glad when we left as I felt no reverence, I'm afraid, only curiosity that people should come from miles to pray at it.

We had a nice lunch (trout soup, amongst other goodies) and thence down to the hydrofoil moored in the cove. It is a trim craft called the *Inca Arrow*, made in Philadelphia, and powered by a Cummins Diesel. It was all but full. Shortly it got up on its wings, cutting through the water at 25 knots or so. Every once in a while we would hit a wave and the bow would dig in briefly, but for the most part it was smooth and swift.

We moored at the Island of the Sun and went ashore for about 20 minutes to look at the Inca terraces. This island has near its crest ruins and artifacts of people supposed to be ancestral to both Incas and Tiahuanacos and during Inca times 10,000 people were supposed to have lived here. Now there are about 80 families on the whole island. Certainly the number of potshards on the terraces indicates heavy past use. From the dock up a ravine ran a long series of steps, rising perhaps 200 ft. in all, with a rushing rill of clear water tumbling down alongside in a stone channel. The entire canyon was filled with large trees—shaggy old eucalyptus and what look like beech trees—dramatic contrast to the bare hills all around. The kids and I foraged for pottery. In spite of the 12,300 ft. altitude we ended up, puffing to be sure, at the highest terrace and hiked down to get back on board. Across the lake, beyond La Paz, Bolivia, we could see the 18,000 ft.

snowy summit of Illimome and off to one side _____, one of the highest peaks in the Andes.

Our guide picked up some trout from the local people on the island and we were off. She said no one drinks the lake water as it is mineralized, but instead seek spring water.

On we went, past the Island of the Moon, where the Incas kept their “Chosen Women”, selected girls used either for wives of the nobles or sacrifice. We saw the compound where they lived. On the other side of the island is a present day Peruvian prison.

Our course then took us through the $\frac{3}{4}$ -mile wide straits of Liquina where we met several Felucca-like craft with big lateen sails and peculiar arched hulls with high bows and sterns. Also, here we passed the ferry which consists of several very broad beamed sailboats that can take two trucks each.

All the kids were sleepy by this time so Barb and I, then Susie, then Dick and Nancy, and finally Phyl came up on deck as we flew along and stood in the brisk cold breeze. Before very long the boat nosed up to a anchorage at the Crillon dock, while hired picturesque natives plied reed boats around us. Soon after we landed these same guys were cementing a wall in everyday working clothes.

On shore we had tea and sweet rolls and soon were off to La Paz in six cars. The road is graded and very dusty. Our driver pushed his car along so we constantly came upon cooperativa trucks which were utterly invisible in huge clouds of dust. It was some entertainment to lunge into these clouds hoping they contained nothing but dust, in order to pass and breathe again. Twice, by the dimmest of signs our driver held back and a truck going the other way materialized, thundering along.

At one point we rounded a turn and the whole spine of the Andes or 75 miles was before us—a jagged snow-covered sawtooth. I could see some valley glaciers and below snowline, moraines and glacier cut valleys sweeping down toward us.

During a couple of stops for flat tires (neither car had a viable spare but had to borrow one) we stepped outside into the bitter cold air and were glad enough to get back inside again.

Dick, by this time, was snoozing peacefully. Suddenly La Paz was before us as we came to the edge of a deep glacial canyon some 2,000 ft. deep. There it lay, lights spattered across the canyon bottom and up its sides. We wound around through heavy truck traffic to enter the city. None of the cars use their headlights except to signal, but turn them off when confronting one another, a ghostly mass of rumbling cars and dust only dimly seen.

Down through the center of La Paz we went—through the mercado and finally to our shining new hotel in Embassy row. The Crillon is very cosmopolitan, has superb food and immaculate rooms through which maids pour in phalanxes to turn down beds and polish already polished floors. We still have Peruvian pillows and impure water in the taps though, but all in all it is a haven after the austerity of Puno. We found we could even get plain spaghetti with butter. WOW!

I had trout and it was superb. Phylly’s meal of pork with sauce was likewise excellent.

Gratefully, we went off to bed, with Dick especially tired, perhaps from a combination of the long trip and the 12,000 ft. altitude.

July 12, 1968
La Paz, Bolivia

Dick was indeed very tired and had a slight fever and so stayed in bed all day. We tried to get some food into him and finally succeeded with some ice cream and a banana. Best of all, however, were some chalk-like tablets called Coramina glucosa C113A, which are specifically for altitude. They perked Dick up dramatically but before he could eat lunch he had subsided and went back to bed. That evening, however, we planned better and got a huge plate of spaghetti and meatballs into him. I walked up to the University of the Andes and felt some bit uncomfortable as I read the bitter anti-Yanqui tirades on the bulletin boards, all directed at Viet Nam. The propaganda was a peculiar mixture of talk about 24,000 folk music groups in Viet Nam and denunciation of our use of modern weapons and of the cost to us.

Later Phyl and I and Barb and Susie went uptown and visited the mercado, the ancient Iglesia de San Francisco (ca. 1540) and snooped in stores. La Paz is hilly, full of little parks and stairs, traffic, cobblestone streets, new shining buildings, and tattered, odorous, mud-bespattered, indian sectors. We walked all the way home and arrived very tired back in our nice warm hotel rooms.

This night Susie developed a king-sized bellyache at about 12 midnight and after a siege and administration of the “remedy” she drifted off to sleep peacefully enough. The remedy is a tiny white Lomatil pill—almost instantly calms the stomach down and makes one comfortable and stops diarrhea like magic—it contains an opiate—plus Kaomycin, which slays all Salmonella bugs like a magic fly swatter for microbes. I can remember when one was in for a week of debilitating sickness with this bug. Now, if you catch it quickly the real disturbance lasts only an hour or so.

July 13, 1968
La Paz, Bolivia

Susie is well and perky enough to have breakfast with us. Dick is bouncy and the rest are perking along well. After breakfast Dick and I went out for a refill on our medicines—just in case, \$13.00 worth. Thence we caught a cab (1 peso or 8 cents ea. to downtown per person). We poked around some of the stores back of the Iglesia de San Francisco and I bought a native poncho of very fine weaving and natural vegetable dyes, plus a little mandolin-like instrument called a charango. The sound box is made of the shell of an armadillo and it has 5 pairs of steel strings. It comes from Oruco, about 250 km. S. of La Paz and is used in most of the native music of that area.

In getting out of our taxi Dick and I landed in a maelstrom of cars, trucks, and marchers in a parade. Today all the native cooperativas come in from the districts around La Paz and have a day in their honor. It was such a colorful assemblage that we quickly went back and got Phylly and Barb. Susie and Nancy were happy just to stay in the nice warm room.

After becoming dismally ensnared in a traffic jam we jumped out by the parade and walked along as they made their way toward the Plaza Murillo. Each cooperativa carried banners telling their area and how good cooperativas were for Bolivia. Almost all wore the clothing typical of their area—ponchos or hats differed, one group wore hats trimmed with flamingo feathers projecting radially from their hat brims. Another group

had a grand flute band. They puffed on double bank bamboo flutes to a peculiar rhythm of 4 or 5 drums, old weatherbeaten indians dancing along the streets and every now and then taking a nip from a communal bottle, while out ahead danced and gyrated 4 men in costumes and masks, obviously playing out some part. In a truck supplied by the *Allianza para Progreso*, a sort of float went by headed up by a man dressed up in a condor skin. His arms extended out under the wings which he manipulated by means of two wooden grips at the base of the primaries. He shimmered them at passersby and was occasionally challenged. Another group featured big bassoon like flutes played vertically, plus wood and skin drums. These flutes had a nose piece but were played with the lips. [drawings]

Still another group played a horizontally held flute that had what I take to be a sort of chanter lashed on top of it. There were different sizes and I was told the chanter tubes each played different notes arranged in a sort of orchestra.

The parade circled around Plaza Murillo and the red-suited presidential honor guard marched up and down smartly clutching their mangers and soon out on the balcony of the *Palacio de Gobierno* appeared a gaggle of suave-looking politicians. They included the president and vice president. Several speeches were given including one fiery one in what we took to be Quechua. The president is an impressive large neat man and his vice president a balding bespectacled smaller man who spoke forcefully. What I could understand told how important the cooperativas were to Bolivia.

Feelings run strong here. Even the old “War of the Pacific” still rankles. One taxi had a slogan plastered across the front window—“Autofagasta es y sera Boliviano” (Autofagasta is and will be Bolivian) referring to Bolivia’s loss of seacoast in this war back in the late 1800s (I believe). The driver didn’t like us much either and I suspect classed every norteamericano as the same.

Now we pack (trying to figure out what to do with the charango) and head for the airport modestly early tomorrow morning for a 3-hr. flight to Santiago.

July 14, 1968

Santiago, Chile

We made it! All our baggage cleared including several obviously illegal goodies like violins. But all that comes later.

Another one of those horrid early morning arisings—somnambulistic children bumping into pillars and sneering sleepily at everything but chocolate on the menu. Then, the luggage, with us steering our 17- jewel millstone topped by the black monster (my 150 lb. book box) into a couple of cabs, shoveling troops aboard and setting off for the airport. To be sure our plane was quite a bit more than a hour late. This, however, gave us time to get overweight baggage allowances in order, seats selected, and immigration taken care of.

The airport advertises itself as the world’s highest (it is near 14,000 ft.). It is located on the plane above the valley where the town is located. Air is clear and cold. Nancy and Susie got shoeshines (1 peso each) while Dick watched the shoeshine boy’s technique with such care that we wonder if he is going into business.

It was pleasant to get back in a new shiny jet—the stewardess was giving herself oxygen, having just come in from New York, while we acclimated types just breathed normally without all that lowlander’s folderol.

Finally, up we went and over southern Lake Titicaca and quickly out over the altiplano, dotted here and there with volcanos frosted with snow. Occasional salinas filled valleys with gleaming salt or reddish pink ponds of saline water and halophytic algae blooms in them.

The land grew increasingly rugged and arid and less and less evidence of human use could be seen. Finally as we entered the Atacama Desert of Northern Chile some extensive areas of sand were seen, broken in two or three places by oases thick with greenery but surrounded on all sides by sand. Finally even this was gone and clouds obscured the view nearly until we touched down at Santiago. Once we dropped down toward the end of our 2½ hr. flight, high hills covered with low brush or what look like dotted oak groves came into view. In the intervening valleys large farms, most with silver-roofed farm buildings covered the landscape. Vineyards and groves of fruit trees stretched away into the haze. For some reason, Santiago was having smoke—long brownish strands highly reminiscent of a smoggy day in Los Angeles streaked bands across the hills. All in all it was pure southern California.

Soon we touched down on the single concrete runway and taxied up to the terminal, wondering if our violins (illegal it develops) or other contraband would make it. Would we be met? We were, it turned out, by a suave-looking fellow named Francisco Silva. He hustled us through customs like magic. While our fellow passengers were having every bag checked, not a one of ours was opened and even our obvious violin cases went by unquestioned. Even the bag Phylly carried, with the neck and pegs of the Bolivian mandolin sticking out went through. There's skullduggery here and I love it and am amazed that our University has the foresight to promote it for our welfare.

We were met by Mr. And Mrs. Hector Hermosillo and their son, the people who are renting us their house. Charming people who promptly invited us to their house for dinner tomorrow night.

Susie had a rough ride because of the altitudinal change and a head cold. She was awfully glad to be on the ground and promptly went to bed at our second Crillon Hotel of the day. This one is downtown a couple of blocks from the central park and is a great gracious comfortable affair with high ceilings, rococo plaster, woodcuts all about, carpets and real drinking water in the faucets. All of Santiago has a purified water supply. Haroo!

Also haroo! We now bill everything to the Convenio, including tips.

Phylly and I took a walk around this European city. Traffic is light because of the high import duty on goods produced outside Chile.

Dinner at 8:00 PM and to bed. Tomorrow we start the dreary process of obtaining our [?]-identification cards allowing us to drive and travel throughout Chile. It may take a week.

July 15, 1968

Santiago, Chile

Early this morning I checked in at the Convenio offices and began our paperwork. Great joy, we were able to contact Leanne Hinton in a nearby hotel and all of us got things going on our carmets[?] (identification cards).

In the evening we had a very gracious dinner in the lovely house of our house owner in Renaca (Hector Hermosillo and family). They could not have been nicer to

meet or be friends [?]. Hector is secretary of the private pilots of Chile and somehow earns a comfortable living. His family has 3 cars, each costing 3X the USA price etc. I'm tired so no more today.

July 16, 1968
Santiago, Chile

We visited the Museum in the Quinta Normal and made contact with the Sub-director, Nibaldo Bahamonde, a crab specialist and a very accomodating and pleasant man. He helped us a great deal, lining up a man to help us study specimens from museum cases, and with library matters.

The museum is old and musty and obviously poorly supported by public funds. There are about 15 staff members. Nibaldo is a crab specialist.

There are some interesting specimens in the collection, mostly misidentified—not surprising since no one has done much since the turn of the century.

A stint of photo taking for the carnett, various details in the offices and some shopping, an once or light tea at 7:00 PM and to bed, nursing a cold. Tomorrow we work at the museum.

July 17, 1968
Santiago, Chile

Leanna and I left Phylly tending kids and caught a cab for the Museum. The cab ride was the highlight of the day. The driver had Von Supe's light cavalry overture on the radio and as it speeded so did his driving until we were weaving through traffic at a true Laurel and Hardy pace. The overture ended about 100 yards from the museum gate with us exhausted with emotion. After that we spent the morning out in the frigid concourse of the museum measuring whales. There are a couple of Philippi's old types out there (*Cephalorhynchus*) stuffed, wizened, and black, with drooping dorsals and rotting pectorals. He apparently didn't know you can't tan porpoise skin (except for the beluga) but did it anyway. After nearly 100 years one could still smell the isovaleric acid odor. Leanna was a celebrity of some sort as the school kids kept asking for her autograph (once mine), but we both lost our charm once we stepped over the railing into the public passageway. At noon we dropped by the local wurlitzer parlor for a bite to eat (freezing too) and thence back into the museum where we waited for a cat named Sr. Tamayo, who is the resident mammalogist here. He finally materialized at about 3:30 and quickly let us work with the skulls we saw on display. He is a tiny frightened man but very accomodating. He spent the remainder of the afternoon peering over our shoulders as we took measurements. Frozen, stuffed up with my cold and weary we quit at 4:30 and headed for the hotel. Tomorrow comes the task of moving to Renaca. I am getting a full-fledged tic over the baggage and likely will not sleep very well tonight just trying to imagine how we are going to get it all to Renaca, and how I am going to handle all those porters.

July 18, 1968
Renaca, Chile

After a fitful night I stirred around at 7:45 and roused the troops. Phylly had packed most everything the night before so it was a rather minor job getting the rest

stuffed in and calling a couple of stout porters. We paid our rather horrendous bill and ate breakfast. Francisco showed and we went off to get a car. We were assigned a nice Ford station wagon and after checking every defect on a sheet (soldered spots on a bumper, scratches on the door, etc.) it was signed over to me and I began the well-nigh impossible task of following Francisco back to the hotel. Chileans drive a game of chicken. It's whose nose is out front and none of this American garden sass about white lines and such bushwah. I was forced to fake out some hardened Chileans but somehow managed to keep Francisco in sight. Soon we were loaded, Leanna was picked up and we exited from smoky Santiago into the campo. The countryside looks just like southern California. May plants are counterparts in the ecological sense. Growth forms are similar—there is an *Adenostoma*-like plant, and other chaparral species, and actually some genera are the same—for example *Baccharis* is here, as is the bay tree. Some birds seem ecological counterparts too—like there are brush birds that have long tails and tend to dive into the brush rather than make long flights. I saw a jay-like bird that was very reminiscent of our scrub jay. The hills are similar too—sparse rocky soil, gullied under the brush. The land has been more heavily used than ours though overgrazing is the rule and the farms seem poorer on the average than ours. Now, however, they are undergoing a very severe drought—the worst in 100 years they say, and this may account for some of the appearances though not all.

As we neared the coast the Monterey pine appeared in full force. Most of the hills back of Valparaiso are tree farms now of this fast-growing straight pine. They cut them when the stumps are perhaps 20-24 inches through and perhaps 85 ft. high. It looks like a good and valuable crop for them.

Finally we crested a hill and dopped down into Vina del Mar. It is a lovely clean town of spotless streets, lined with trees, very nice houses, many shining modern buildings, a pretty well-tended plaza with flower beds, bay, palm, sycamore, pine, and araucaria trees, plus a fine fountain.

We continued on north of town along the coast and within a few minutes came to Renaca, which is a little village clinging to the hills above the sea. Before we knew it we were at our house. It is a fine artistic affair set on big poles and made of cast cement slab walls and wood. The house is separated by sliding glass panels or sliding doors in several places. The wood is a soft beautiful kind that Hector couldn't name for me. We have a bedroom that overlooks the sea (we can pull the drapes open from the bed and peer at the winking lights of Valparaiso across the bay). The surf booming on the nice beach just below us keeps us company during the night. Our living room looks out across a broad front porch to the sea as well. The kids have bedrooms in the back and an extra bath. Leanne is occupying one of these rooms too. There is a fireplace too, but I think we may have trouble getting much wood for it, though likely I will try.

Our kitchen is tile floored, with a little stove with an uncontrolled oven, a propane heater that turns on when one demands hot water (I had a terrible time with the pilot on the one in our bath but finally mastered it). Garbage is dumped through a chute in the wall and thence into a garbage can. The "basura" is picked up 4 times a week. Talking to the tradesmen, in this case the garbage man, is the toughest experience we have met with so far. They absolutely do not understand that they must slow down to be understood and they clip all the remaining syllables off their words. I have enough trouble

without this. For insistance, sabado (Saturday) becomes “sa”. For heaven’s sake, that won’t do.

We love this house and it is comfortable for all of us. The kerosene heaters are left on low all the time and keep us comfortably warm, a major blessing we can see, as it gets chilly at night or when the fog closes round.

Phylly whipped out a bunch of spaghetti mix, and after a foray into the local stores (the local supermarket sells only canned and packaged goods) we visited a *carniceria* (meat store) where we picked up some ground meat (*carne molina*) and a couple of chickens and some great big eggs, and home. The spaghetti was built and everybody sighed in relief that the food was once again just like that at home. Dinner was held on our long pine table, darkly stained.

The *Hermosillas* had put flowers around and the place was immaculate. What grand gracious people. Both the Mr. and the Mrs. She is very thoughtful and told Phylly many valuable tips. Their children too are fine folks.

July 19, 1968

Renaca, Chile

Breakfast watching the great breakers curl over and crash on our beach. Birds are everywhere especially pelicans, cormorants, and Peruvian boobies. The pelicans amuse us all as they swoop along the crests of the waves almost touching their curling faces before they break, rising over the crest just in time as the crest curls out of equilibrium.

This morning I dressed in suit and tie and walked to the nearby marine station. It sits on a rocky point of land jutting out into the sea about ½ mile from our house, an easy and pleasant walk down the shore. Good thing I went, as even though it was Saturday I found the Director waiting for me . . . a rather ponderous pleasant gentleman, bowed down with paperwork, bearing a jutting set of chin whiskers. I felt a bit chagrined that I had not come in the day before, but I guess it didn’t matter too much. *Senor Anelo Aguayo*, the Director, was leaving on Tuesday for London and a conference on Antarctic matters and was anxious to get me settled before he left, so we discussed where I might work (he offered me both his office and his lab—I took the latter) and then we toured the lab. Marine labs are such grand places—all full of smells of the sea, salt water, urchins, nets, boats, rubber boots) and full of little nooks where people work amidst their piled-up papers, microscopes poking out here and there from the pile, with little aquaria behind full of scuttling little animals, and usually partly filmed over with algae. Nearly everyone can look out at the sea or the algae-covered rocks if he turns up from his books.

Sr. Aguayo works on cetaceans and sea lions. He offered to turn over to me the data he had gathered from a pilot whale and a couple of beaked whales. I think I may offer him a coauthorship with me on my marine mammals of Chile. NSR had not yet written to him about inviting him on our trip, so I avoided discussing that issue.

The lab is really an excellent one, I think, and has the usual mixed staff of Argentines chased from their country by Onganía, and Chileans, working so it seems, happily side by side. There is a very nice auditorium, and they have several small boats here and a larger vessel in Valparaíso.

Back at the house we left the children happily playing in the neighboring vacant lot and set out for *Vina del Mar* to attempt to mail letters. The place closed up in our faces so we poked up and down the main commercial street, buying bananas, bread

(sawed on order from great, heavy loaves), tried unsuccessfully to find some spices, but came away with pepper and hot sauce, smoked sierra, cheese, avocados, salami, some towels, and a whip (we have no egg beater or spatula).

I found an absolutely glorious lamp composed of a great stuffed 6-foot snake curling up from a base with a socket in his mouth, standing a full 5 ft. high or more. If I can figure out how to pack him I will dicker with the owner. It is a herpetologist's dream.

Phyl and Leanne and I then drove down to Valparaiso, a fading city of tiers of houses, rising on the steep hills, of extensive wharfs, of old Victorian mansions with cupolas, widow's walks, scaly shingles, belgian glass windows, and ornate iron work. Otherwise a jumble of little houses cling to the hills. We stopped to talk to some fishermen who had come in on a shingle beach in their long double ender clinkerbuilt canoas—perhaps 20 ft. long, and each venerable with use. The catch was mostly merluce (a cod) and we found one boat full of sierra, bought one for 5 escudos from the boat (it was delicious baked). Leanne bought some locos—a big limpet that tastes like an abalone and has to be treated in much the same way. Then we stopped at the main fishing dock. Several merluce boats were tied up and unloading. All fished with big trawls apparently at considerable depth, and all were filled with fish being boxed and filleted in many cases. To the sea side waited an incredible fleet of birds and sealions (*Otaria*). The harbor was perhaps ¼ mile wide and nearly covered with birds, mostly cormorants and pelicans. Little boys on the boats tossed an occasional merluce to the flapping hoard. Sea lions rose amid them and aggressively advanced with mouth's open, the birds retreating a few yards. Finally, as if on a signal of some sort (I'm sure there was some mode of information transfer involved), the birds flew in a few moments away from the boats and settled near some navy ships nearby. We did not think there was any food at the other place and were at a loss to explain why they left or what the signals were. One thing, the boys continued to toss fish and we could see schizophrenic pelicans, drawn toward their fleeing friends, but hopeful of some food. Finally all left anyway. In this lies the explanation of how birds can quickly congregate over food at sea from long distances, with probably only slight visual cues involved. Or is there sound involved that we cannot hear?

We retreated to home ourselves, first mailing our letters and determining that we could use the Marine Station Mail Box (Casilla 13D).

A nice dinner of fish, boiled locos in sauce (Leanne first prepared a sauce that tasted like crankcase drainings but did it over with better success), and thence to bed, and since I had mastered the pilot light in our bathroom heater, a nice warm bath (the bathtub sits in a glassed enclosure overlooking the bay).

Tomorrow is Sunday and we will do little until after lunch and then take a ride to the north of Renaca.

July 20, 1968

Renaca, Chile

The morning was spent puttering around the house getting various things in order. Dick and Susie are constructing a grand fort down in front of the house in a huge castor bean tree. Forts seem to be essential wherever one goes. Nancy and Barbie have found some skate eggs and upon opening one found it to be alive with a big orange yok sac.

They put the hapless beast in a salt water bucket and the unopened eggs as well. The beast wriggled on for 1½ days (this is being written late).

In the afternoon we piled into the car and drove northward toward Con Con on the Aconcagua River and Quintero, somewhat farther to the north.

The road runs along the shore which is a series of rocky bluffs and coves, very reminiscent of the Monterey coast. Many picturesque houses, some built in the rocks, are to be seen. Clean, prosperous looking villages dot the coast, each with seaweed salesmen (they bake the stuff) and marisco stands (shellfish). We watched birds—kelp gulls, Inca terns, grey gulls, cormorants, pelicans, etc. The road went behind extensive gray beach dunes at the river and led us through fields with eucalyptus and Monterey cypress windbreaks. At Quintero we visited the shore and on our way back stopped at a cooperativa meeting where the girasos and their senioritas were dancing the Cueca—an attractive dance of separate partners twirling a handkerchief or a small poncho in one hand accompanied by tapping feet and jingling spurs. The guasos came in on horseback, very erect and splendid in their horsemanship, perched on peculiar soft saddles held with a broad leather strap over the saddle. The guasos, with their bright striped poncho run through an epaulet of one shoulder and flat broad brimmed hat, were very “macho” and grand—all tanned with mustaches.

Back at Renaca we are settling in, learning how to do the ordinary things of life which is really great fun and the fabric of what makes our experience so interesting.

July 22, 1968

Renaca, Chile

Today was banking day. We set out to arrange to draw our salary. At Vina the bank director referred us to Valparaiso and a American, Mr. Rogers, there. That brought on a rather harrowing ride through that sinuous town of ups and downs finally ending at a busy square which we circled and circled and finally parked in. Banking is complicated but Phylly's courtesy card did the trick and we can draw either dollars (for the black market—they draw 9.5 escudos per 1\$) or escudos at 7.9 escudos per. Mr. Rogers, when he saw us drawing escudos, confided in us about the market.

We then returned to Vina and opened a checking account. Women have troubles and Phylly would have to be notarized to go on this one so only I am on it. It's obvious that the woman's place is several steps below that at home.

We shopped and I worked in my cubby hole of an office at home. Kenny Bloome and Berit came in this afternoon from Santiago and will now have to get settled. They had a very interesting trip down.

July 23, 1968

Renaca, Chile

Today was spent getting our lab space straightened out at the Estacion and in getting Leanne and the Bloome's houses nearby. All came over for dinner which was a towering social success with 2 bottles of wine (80 cents each) (delicious) and \$1.10 worth of lamb chops (also delicious).

Crisis of the day solved. There is a toilet paper strike that was just settled but we managed to get 4 rolls even though the supply has not yet begun to flow back to the stores.

July 24, 1968

Renaca, Chile

I picked up the Bloomes at their hotel and on the way back we noted a biggish blob on the Renaca beach, rolled up during the night of high waves. Soon I could see it was a beached whale. The kids came screaming up telling me it was a beached whale. Closer inspection showed it to be a badly decomposed specimen of a Cuvier's beaked whale, probably 3 weeks since death. Leanne and I measured what we could and then I set about getting the skull out with a kitchen knife. It was a miserable stinking job. I was accompanied by a continually chaging flux of visitors. It finally came out that we even had been on the local radio. Shortly buses came up and I was forced into delivering a rotating lecture in halting spanish to kids, school girls, old folks, etc. One gent was highly exercised when he learned I was an American and not Dr. Aguayo who knew everything about whales. I finally mollified him by explaining I was working with Dr. Aguayo. It was interesting to see his anger subside. These visceral things are so chemical and cannot be shut off with the speed of thought, but instead must subside while the chemical balance is reestablished.

Even through the stench I was interested to see the very peculiar anatomy of the beaked whale head—it needs careful study as it is only reminiscent of the delphinid structure. There are, for example, quite different sac arrangements, and the melon does not appear near so completely fatty. I, however, was some busy holding my nose so my dissection suffered.

Phylly and I hauled the skull dwn to the Estacion where it was put on the roof in a big plastic bag. By the time this was all over I retreated for home and attempted, but failed, to get the odor off. It lingered all night and gave me nightmares of eating rotten pot roasts.

July 25, 1968

Renaca, Chile

All night long we could hear the boom of the surf, and yesterday the paper had advertised "Olas Altas en Valparaiso". Boy, they sure were. First thing this morning we looked out and great combers probably 30 ft. high rolled in from the southwest, row upon row, curling and splashing into sprays of foam and acres and acres of creamy aprons of water before the crashing breakers. Streaks of brown foam striped the waves as they curled and broke, from the eroding banks on shore. The sky was clear and calm, making a very peculiar storm indeed—but a storm it was as the waters rushed over the beach, over sea walls, into homes, across the main highway in sweeping masses of roiling water, crashing against anything in their path. Garage doors left closed were dashed to kindling wood, boats left on the beach were heaved on the crest of retreating water into the maw of the great crashing masses of water. Towering spurts of water rushed into the sky when the water hit embankments, tearing out planting, upturning park benches and rolling up masses of succulent ground cover.

Before long we made our way down to the shore with our first business of the day—the preservation of Nancy and Barbara's skate eggs. I had promised them to take them out to the marine station on this inauspicious day to put them in a sea water tank. As we rounded the corner from our house we were met with a road strewn with debris,

half flooded with water, and running as wave after wave spilled onto it. Here and there aimless homeowners wandered, wondering what to do. In places the sidewalk had been undermined and stood in separate pieces, separated by chasms flooded below with surging water. We tried but failed to get to the station. Instead we were stopped at a promontory where one of the estacion scientists was pushing his car for protection. Beyond us lay a bend in the road and then the station. It was a stretch of chaos not to be passed in safety by anyone, let alone a family group with a bucket of skate eggs. The water slurped onto the road by the thousands of gallons, enough to wash a person out into the maelstrom. The 50-ft. high rock in front of the station breasted the swells and caused them to break in shooting sprays of foam and white water that shot into the sky twice the height of the 60-ft. station roof. Behind the station another mass of rock broke the full force of the pounding water and added a white backdrop to the wild scene. A spray haze was everywhere in the air.

Dr. Buckle, whose car was pushed out of danger, looked back with haste in his face but paused long enough to tell us that the station boats were gone, the water had rushed through the windows into the lower floor of the labs and into the basement causing much damage. We asked if we could help, which message seemed to have translated "Can we work today?" No, the station is closed, he replied, turning and trotting off close to the cliff side of the road, back to the station. We watched him go, threading his way between the breaking waves.

We turned back toward the house and had no trouble reaching the safety of the dry road and finally our house up safely on the side of the hill where we could watch the scene below us. Where I had flensed out the whale yesterday was in the midst of the breakers, with water surging over the crest of the beach, under the bridge and up our little lazy river channel. The abutments of the bridge were being cut away and I wondered if the surging mass of water would not simply lift the bridge from its foundation and drop it into the water. It did not, and before afternoon, the worst was over.

The afternoon was spent getting our children ready for their schools. Dick was taken to "El Tigre" in Valparaiso, where he was outfitted like a little dandy with a navy blue jacket, gray pants, a neck tie, a kind of overall used for activity involving dirt (which I am sure Dick will indulge in). He also has a lovely insignia with a lot of latin letters in it.

Later we took Barb and Nancy in to be outfitted for St. Margaret's school. They are now decked out in red jackets, gray jumpers, gloves, gray knee socks, ballet tights (red), special gym shoes. Tired, empty of loose change, we made our way past army road blocks set up to tell people the road is closed beyond Renaca, to home. A nice dinner of lamb chops, boiled potatoes, carrots, and cookies.

July 26, 1968

Renaca, Chile

The storm has subsided a lot, though there are still groups of high waves that come in once in a while. The shore road is a mess but passable between the station and Vina del Mar, but beyond this is blocked and the troopers still stand guard shunting people up our street, and over a detour to Con Con. The papers blame it on a subterranean disturbance somewhere between Easter Island and Australia. It could not, in my opinion, be properly called a tsunami, however, as the typical pattern of a series of

swift low waves that draw water away from the coast was missing. It was simply a rash of high waves, much more reminiscent of a storm than a shock below the surface. Further, the high waves lasted for nearly 48 hours and were very regular during that time. One could predict that groups of very high waves would pound the shore every 15 minutes or so, and the intervening waves could hardly be called small, since they too washed up onto the streets and shore.

Leanne and I went down to the marine station to see if we could help. It was a most frustrating experience. Everyone was just standing around. We finally realized that their reactions and methods for dealing with such a situation are very different from ours. We wanted most desperately to get a shovel in our hands, to pick up debris, to be assigned a room to clean, to pick up wood off the beach, to dry books, to gather Dr. Fisher's sample bottles. But no, they would inventory first, then begin to clean machinery soaked with the water, and likely the professional staff would merely direct activities. I was given a job—that of photographing the damage. It was extensive. Water had rushed through windows on the lower floor, breaking doors free on the opposite side, homogenizing the contents of samples, furniture, equipment. Down in the basement was chaos. Incubation cabinets had been flung 30 ft., nets, tools, supplies, excelsior, etc. were all mixed up with seaweed, shattered fragments of boats, pebbles, shells, and sand, and even a live fish or two (one *Sysiastes*, the huge local clingfish). I photographed everything and even caught one new series of waves crashing over the rock out front.

We listened to a little pep talk by the station founder and now head of science at Valparaíso, Dr. Yanez, and then went home. It was pretty obvious that we would be more in the way than anything else.

I spent the afternoon writing on my book, which is coming along pretty well for a change, though I'm not sure I like the tone or the style I'm using.

July 27, 1968

Renaca, Chile

Dick's birthday today. Yesterday we had done a little shopping in the afternoon and had taken the kids out to do some shopping for him. They wrapped his presents out in the form of bugs (Nancy), dogs (Susie), whales (Leanne), or just presents (me and Phylly). We entreated him to open the bug in the morning and it proved to contain a perfectly lovely three-tiered bird cage for his little finch Cabeceo (means nod)—a Chilean mourning sierra finch (*Phrygillus fruticeti*). This bird is called a mourning finch because the male is mostly black. Ours is a pretty female with a nice buff mask and otherwise sparrowlike body. The street salesman said it "canta bien" but thus far she just cheeps.

Leanne had to get her driver's license so we dumped her off at a government building in Vina and went on to Valparaíso, around the shore, to pick up jackets. No jackets so we had to return and killed a little time getting photographs taken in case we needed licenses (we don't as our trip to Peru will renew the three months time on our international licenses).

We picked up Leanne and went back to Valpo where after getting the clothes, we spotted what looked like a market out in the center of the mall. It proved to be one of the most complete and biggest we have seen. It was composed of two four to five-block long

lines of stalls. There were mountains of lovely produce of every conceivable kind, and men and old ladies shouting out in rapid spanish. Boys held a handful of lemons and chanted a cry over and over, or walked along garlanded in strings of garlic, chanting its virtues. There were neatly wrapped bundles of kelp (cooked with meat), stalls full of rabbits (conejos—little guys, and great big liebres), killed and cleaned right in the stall, chickens, ducks, pheasants, all kinds of shellfish (how did they get them with the storm?), congrio (a delicious big brotulid), hake in great quantity (the area's most abundant fish), and believe it or not, what look like sticklebacks about 2 inches long. There were stalls with nothing but clock parts, ones with old pipe fittings, ones with records blaring out. Best of all there was a pile of bird cages with a lot of local birds, behind which was a wizened white stubbled old man building cages and peering at us out of dirty Benjamin Franklin glasses. He also had two parrots, one little one and a bigger one. Phylly automatically gravitated there. I asked the price of the bird. Cincuenta y cinco escudos (about 6 dollars). After much hemming and hawing about quaranteens and additional travel millstones he was bought and proved to be an Austral parakeet or "catita chica" (*Microsittace ferruginea*).

He proved a great hit with the kids as we walked through the market, and an even greater hit at home. He is duly named "Chispa", which means sparky.

It wasn't long before he was riding on everyone's shoulder (he likes the girl's long hair and cares very little for a ride supplied by me).

Hector Hermosillo Jr. dropped in during dinner as we were having our cake and joined us in singing to Dick and in watching him open presents—a new Chilean knife, a Chilean top or trompo, a lot of chocolate (the Bloomes showed up with some of this and the top). All in all a grand party, complete with a Duncan Hind's cake improvised by Phyl, from a box sequestered in the suitcase.

July 27, 1968

Renaca, Chile

I wrote today on the book. In the afternoon the kids and I went down to the beach to gather bright-colored pieces of wood for a collage of the storm I am planning. We found all kinds of limpet shells and lo and behold, the ribs of a very very old wreck cast up by the storm. They were teredo riddled but the massive red wood and old iron tie rods held in place with lead still there. We hauled them back to the yard, after a fearful struggle. It will make a magnificent base for a table in our new house, but doubtless will cost a penny or two to ship. It must weigh 250 lbs. Delicious roasted conejo, notes, and to bed.

July 27, 1968

Renaca, Chile

The kids start school tomorrow, except Susie, and both the Bloomes and Leanne have found houses nearby. We hate to see Leanne leave us, but she will be having many meals with us, and working a good deal here.

July 28, 1968

Renaca, Chile

Today is woe day. Oh, woe, woe, tomorrow, we hope, will be better. Sleepily we gathered ourselves together—breakfast before dawn with the fog casting haloes around all the street lights down on the street below. At the first light came over the gray water we piled into the car and took everyone to school. I ushered Dick into McKay—very British—like Groton, all the kids in their gray blazers, scarves, etc. Most looked bigger than Dick. He was led off by a swarthy young fellow who gave him directions in spanish, which Dick rightly enough ignored. He tried to follow me but we successfully turned him around as I left. Later we found he had been in 3rd, 4th, and 5th form, but finally reached his own level. He has classes for 7 hours and then has games or study until 4:30 PM. He came home happy with 3 small friends.

Then we took the girls to St. Margaret's. It is a lovely posh girls school for 550 girls. It occupies a whole block of shaded streets, pretty buildings . . . Susie, who had not wanted to go, was spirited off with a couple of English-speaking girls. Nancy and Barb, in uniform, went off into the depths. Both Susie and Nancy were in classes taught only in spanish. When they came home at 1:30 they were both grumbling and moaning about the classes and the turkeys who gobble (people who speak spanish). Oh woe. Susie downright refused to go back tomorrow. She was traumatized by the social situation. The woe persisted until Susie went to sleep. After much consideration we decided to declare a moratorium and have her and Phyl seek alternatives before making a decision. The stress of being forced to limp along on a few words of spanish was just too much. She was just too obvious and different—things Susie cannot take at this point. Nancy will cope with the situation and Barbie already has “millions of friends.”

Leanne and I went out to the station and worked on the *Globicephala* and *Ziphius* skulls there. Comparing the pilot whale with the old figures in True. The example we had before us was obviously closer to *G. milaena* than any other form, though there are obvious affinities with *G. scammoni*. How does an animal on the west coast of S. America have such affinities, from the historical standpoint? It indicates interfertility, at least in the past, plus climatic changes sufficient to bring stocks across the equator that now only come as far south as New Jersey. Did the crossing come in the Atlantic and go around the Horn? Which is oldest? Could the Humboldt Current play a part? What happened to *G. macrorhyncha* during all this? Any chance the stocks could have made an interglacial crossing of the Arctic Ocean? With the presence of a probably *G. melaena* type in Japan and the southward sweep of the California Current matched by a similar northward sweep of the Humboldt Current, isn't the Arctic route the more likely?

July 29, 1968

Renaca, Chile

Leanne kept making mistakes—she spelled the latin names wrong, and when I corrected her, did them right and then put the wrong name on the animal anyway. It seemed that every incorrect permutation was attempted and we never did get things very close to right. We tried to work with the *Ziphius* on the roof and had to quit before getting things very well in hand. Shopping intervened. There are so many things the kids need. It is unbelievable the amount of clothing the kids have to have to attend St. Margaret's. We have to equip them for the “sporting club” where they do the long jump, play hockey, etc.

Moosemeat and Frau have a nice house just down the road from us and will move in probably tomorrow. They will be very glad indeed to get out of a sterile hotel into a house where they can cook all their goodies.

July 30, 1968

Renaca, Chile

The cursed alarm rang so far before sun-up that it was pitch black. Leanne and I had to go with the Bloomes to Santiago to tend to a lot of business there. I had museum work to do, and the Bloomes had to pick up a car and settle other domestic issues. We drove to the train station and left Phylly with the car (her first solo flight in Vina) as we boarded the spanking clean train. It is connected to a club car where one can have martinis at 7:40 AM if he so desired, or better, a cup of coffee. I slept mostly as we lurched along. The roadbed is very rough—the railroad equivalent of a washboard road. We fairly loped along in places. At the great, vaulted steel station, all fixed with metal curlicues, we disembarked about 2:20 minutes from Vina. It was a modest walk to the Convenio offices. There we tried to settle our travel advance for Iquique-Antofagasta at the end of the week, and a variety of domestic issues like torn sheets, and how do we get a heater for our house.

Leanne and I left for the cheerless Museo Ciencias Naturales, where we set up our work in the library, photographing and reexamining the 100-year-old type specimens of Professor Philippi. Mostly, we think he is wrong, but there are some interesting things to be seen, including several skulls that are difficult to assign to a species. We decided to eat after we finished and Leanne almost didn't make it, being famished from nearly no breakfast, and being saved only by a thoughtful librarian who gave her half an orange to tide her through about 3:30 PM. I was so happy to be working on specimens that I couldn't have cared less. We finished at about 4:00 PM and took a cab for the Convenio, stopping on the way for an empanada (a pastry with meat filling) and some other food, which revived us (I having faded perceptibly, once we left the museum). We found Moosemeat and frau at the Convenio, marched off with about 2,000 dollars in checks for our work in Iquique (the Convenio operates on a cash budget of \$10,000 at any one time and there are 25 participants in Chile, so we did make a bit of a dent). Moosemeat had a car, and after arranging flights, etc., we drove back, arriving at about 10:00 PM, very tired, and happy to go to bed.

I am using the lovable technique on the Convenio office. The head man, Gene Menzies, we have named Smiling Jack. He always looks like he was on the south end of a semiripe quince. I have made him smile though, painful as it was. But we are getting cooperation.

July 31, 1968

Renaca, Chile

Today was another day spent trying to straighten out our world here so I can go to work. First we had to buy Chilean traveller's checks with the money from the Convenio and that involved a lot of going from bank to bank and finally to Valparaiso, where calls were made to Santiago, and finally the checks issued. The amount—about \$1,500—is so big here that special precautions are taken. It's better, however, than carrying escudos around in that amount. The biggest bill is a 50 escudo note, or about 7 bucks (7.8/1

dollar). Then we went shopping briefly. It takes all one's time just to shop. We bought a cogrio, a big, tasty brotulid, at a shoreside fish market, a leg of lamb cut in a curious way (people make several meals from one such leg and require them to be cut into parts representing meals), some more clothes for the sporting events of the girls and Dick, and things like eggs (wrapped three at a time), bread from another store (sliced on a machine—very dense and very good), wine from another store (cheap and the best dry wines are delicious—they don't do well on sweet wines), vegetables from another, and finally a sort of dry stores store where one gets powdered milk, jello, marmelada, spices (what few they have here), paper products, etc. There are lots of sort of delicatessen-type stores in which all kinds of peculiar goodies can be had. Most of these the kids will not touch. They are on a boiled potato kick now.

Carne means beef and we get it Friday and Saturday. On other days everything else is available—chickens (with the heads nicely left on, and obscure innards retained), lamb in all classifications and cheap, pork, likewise. One can buy heads of all these with the eyes balefully peering at you, or hooves on all, with the hard outer coating removed. There are several delectable ways of presenting the intestine. The most charming comes in a braid.

In trying to outfit the kids we ran into a lot of oddments. They have to have copy books specially printed for geometry (lined on one half a page and plain on the outer half), but there are none anywhere. A couple of texts are likewise unavailable.

So it goes. Chileans are trying to develop their economy and hence have high tariffs on most foreign goods. They now make a surprising array of goods. This includes things clear up to autos (they make a funny little pint-sized pickup with two front seats called a camioneta, which is very popular, the price being much lower than imports). An imported knife may cost 15 dollars vs. about 2.50 for a Chilean version. We tried for days for an egg beater and finally found an astronomical imported version (which we bought).

I unpacked a lot of my gear at the station. We are now complete there. The station is settling back to work though many windows are boarded up and some walls are smashed and much gear is ruined.

Everyone is very tired so off to bed.

August 1, 1968

Renaca, Chile

More time getting everyone settled and minor details out of the way. Leanne is moving into her nice little house up the hill. It has a grand view of Valparaíso across the bay, a fireplace, and a splendid backyard which stretches out into the campo with no break for 10 miles. She had to buy a little portable heater though, to warm the house, even with the fireplace.

We bought some coal and firewood, for so many cents a stick (10 chunks of eucalyptus cost about 30 cents). It turns out that the fireplace plus our two kerosene heaters are too much and we have had to open the sliding glass doors in front for a little air.

I ordered a couple of handles for my harpoons and it was like entering a new world—a whole new set of terms to be negotiated. I ended up with some octagonal

handles about 4 meters long made of aurucaria wood. This, it turns out, is the best for work in salt water.

Nancy went to the sporting club today for her gym class and we threaded our way through back Vina to pick her up. It turns out to be an incredibly posh huge place with a great old Victorian grandstand and an immaculate track and acres of green grass, horses standing around nibbling contentedly and various teams hockeying it up. All around are huge old trees, well tended, lining broad paths with appropriate instructions about how far cars can go.

We found Nancy amidst a gaggle of her schoolmates and some boys from another school all getting ready to leave.

At the station we unpacked the remainder of our gear and made ready for the trip to Iquique-Antofagasta coming up next Monday. The station is functioning pretty well now though they find that there is absolutely no money for repairs in the University-wide budget.

I finished Chapter 3 of the book this morning—things go pretty well on that front now. I start describing the bubbles capture next.

August 2, 1968

Renaca, Chile

Today was hike day. Some time ago I had decreed that we would begin walking beaches in search of stranded marine mammals, and the inactivity was beginning to tell on us so today we took a hike.

In the morning Leanne, Phylly, and I drove to Valparaiso where I shopped around in the naval stores places for manila line, buoys, tools, and the like. It was fun poking in these musty old places, and amazing how little they have to offer. One was apt to find all kinds of things mixed in with the ship materials—old clocks (horribly expensive), L.C. Smith typewriters of ancient vintage, old oil cans, statuary, guitars, shoe repair machinery, etc. Being essentially a junk collector it was pure ambrosia to come trundling in, burdened down with a coil of rope, nosing around these nooks. We bought a couple of pack sacks and a fresh sierra mackerel plus some merluce roe (a hake very heavily fished here—females yield up nice-looking roe—called “regalos” or “gifts”). Leanne picked up a heater (butane, portable) and we headed for home. Oh yes, we also bought some wood and coal for the fire.

In the afternoon Phylly drove Leanne, Susie, and I up to the Aconcagua River above Con Con. Our plan was to hike on the dune-lined beach toward Quintero, 22 km. distant. If we got tired we would turn back, presuming we knew which direction was better to go at the time. If we made it to Quintero we would catch a bus back.

So, with new pack sacks on our backs, loaded with apples and oranges, TP, cameras, and other sundries, we left Phyl on a dirt road about ¼ mile from the beach. Our first encounter was with a farm house equipped with easily 15 dogs, all docile fortunately, all skinny. The farmer was out in his field sowing grain by hand as we went by down his dusty rutted road. Before long we reached the flat marshland back of the beach where we saw some interesting shore birds, a beautiful black-and-white stilt, some caracara-like raptorial birds. Thence, over the gray dunes to a very broad beach dotted with the shells of the macha—a kind of clam with a calene triangular shell, about 4 inches long. The surf boomed in, the gray gulls rose ahead of us as we walked, and

occasionally small flocks of a little, puff-sized plover scurried over the sand in front of us. This species had a black eye bar, a black bar beneath, and a sandy white back.

I walked the dunes behind the beach where the storm had swashed over, spilling now and then across the railroad tracks behind. Great piles of trash had to be scanned for bones, smelled for hidden carrion and inspected for attractive junk for my collage.

We passed railroad men repairing the roadbed where the waves had cut in, we passed a lagoon where I found a dead goat and Leanne spotted a perfectly good (but dead) Humboldt penguin lying on the sand. We inspected his scaly, flipper-like wings, the tightly imbricate body feathers with their dense underlying down and then went on. Ahead of us were two Chilean men with huge bags on their backs trudging along as were we. They may have been blindlestiffs—folks that have all but disappeared from the American scene, or they may have been farmers or fishermen walking home. We never learned as their purposeful hiking took them farther and farther ahead of us.

Everything on the beach was worthy of our curiosity—kelp bones (the dried stalks of the local giant kelp, which with their holdfasts look like grotesque bones), vast numbers of wine bottle corks, corks everywhere. Soccer balls made of plastic and broken were also everywhere, as were the handles of little hand scrubbing brushes. A couple of kinds of plastic objects—one a funny little sphere with holes in it, another a lattice work of various colors, never were identified.

Leanne developed blisters so both girls took off their shoes. On and on we hiked, the sun dipping lower into a clouded horizon. No chance to turn back now as there was too much distance behind us and those lines on the cliffs ahead were seeming to materialize into houses of some sort.

I picked up an immaculate little bird—a whale bird (slender billed, blue-footed whale bird, rare in these parts). He was still alive, though very weak. Black-capped head, blue legs, white breast, and long, graceful, pointed wings made him a lovely bit of life. We hoped we could save him. Susie tucked him in her coat and held him in both hands as she walked along. Patiently thus she carried him until we reached home some hours later.

The houses materialized into some nice-looking A frames with grassy plots around them. Horses appeared dancing in the sand. Up and over the dunes we went into the little hamlet of _____. Stopping by a battered fence we asked a man drawing water from a well by hand, where we were. “Como tres kilometros a Quintero.” Three kilometers we could negotiate but it was clear, not before dark [?]. As we sat upon a big eucalypt log eating oranges and apples a spring wagon, gaily painted with red wheels and bearing two bouncing children and an older boy jogged by, bouncing over the ruts while its shaggy horse paced along.

We trudged up the dirt road, and soon met curb to curb cattle, driven by a man and a boy, followed by two big dogs. The cows gave way to us as we passed. The hills around us look like Southern California—rolling, grassy, lined here and there with windbreaks of Monterey cypress trees—old, gnarled, dark trees with spreading, pointy limbs shaped by the wind. Monterey pines grow here too—in big groves.

As darkness became complete we topped a hill and could see the lights of Quintero ahead of us—soon we came upon a little magazine store all alone in the darkness, giving a warm glow of light from its opposite side. I walked around, sending kids scurrying in every direction. Inside was a lady ironing, waiting for some business in

this lonely field. Her iron was a tall, heavy, metal affair filled with red-hot coals, which glowed through ports in its sides. She told us we could wait at the corner for the bus, which we gladly did. Weary, we sagged down on the welcome wall of a cement viaduct and waited for our bus, hoping we could recognize it when it came. One thing in our favor, there's no place for a bus to go but to Vina from here. All kinds of rickety cars went past, we listened to the frogs calling over yonder, watched a plane land on the very short runway. Finally Leanne said, "I'm going to hitchhike." Up she got and flagged the next truck rattling down the road. Miraculously as she did so, lights came on its front and it transformed into the Vina bus. Happily we climbed aboard, paid our 4 escudos 20 centisimos (about 50 cents for all three of us). After a while people enough got off so we could sit down, Susie with her bird, then Leanne, then me.

The bus let us off right at the base of our hill and it was almost more than we could manage to scale it. Then, everyone at home was so full of his own doings we had great trouble getting them to listen to our heroic adventures. "Why didn't we bring the penguin?" Oh well, another generation will realize how great was our effort.

August 4, 1968

Renaca, Chile

Saturday and we slept late. With Dick having to reach McKay's at 8 and Barb and Nancy, St. Margaret's at a quarter to 9 we have to get up before it is light weekdays, especially Phylly, as sometimes I goof off and snuggle down under the covers looking small after she has left. Anyway, blissful sleep after it was even light.

I wrote on various things this morning, mostly regarding plans for the coming trip. Later we dropped by the marine station and picked up some of our gear. Phyl and I did some more shopping for the kids. Amazing but Dick needs some more clothes—tennis shoes for the "sporting club". They'll think of something else, I'm sure, before we get out of their clutches, and by then we will have three children with complete wardrobes including everything a young girl (or boy) can be expected to wear when presented to the queen. What queen? This is a republic. Ah, but the English here, even though Chileans for generations, are as pure Devon or Cornwall or whatever as they can be—ginger moustaches, accents, tweeds, and all. The headmahster out at McKays is one of these.

Dick has been pining away to go fishing and I have vague, amorphous plans for a bit of trout in the south, so we bought an inexpensive outfit (by their standards here). Dick and I went down to our beach before sunset to try for corvina in the surf. They use a silver fish, cast out into the waves, and retrieve it. Dick says they were catching them right and left the other day, but true to surf casting fashion, no one was catching anything this day. Dick did get to practice casting though.

August 5, 1968

Santiago, Chile

Today was spent in preparation for the Iquique trip, in writing, and in a little hiking with Dick on the beach, along with some practice casting. (He is getting better, I worse.)

After dinner (roast pork—good), two cars of us left for Santiago. Elda Foggetti from the station and Leanne came along to take the car back. The other car was a Fiat

driven by a Chilean-Italiana dubbed Straight Arrow. She fired through traffic like a guided missile. She carries a Berretta pistol which she shoots periodically at birds and things. Straight Arrow led us to the Hotel Foresta—nice, clean, full of nice art, with signs saying “Keep your baggage off the plush.” So to bed.

August 6, 1968

Iquique, Chile

Before breakfast into all the chaos of the Chilean local airport where LAN and one other line go to various places in Chile. After quite a lot of confusion and \$25 for overweight baggage. Thence into a nice Boeing 727 and off to Autofagasta and Iquique. The flight led first out up the central valley alongside the towering Andes, which we could see were only flecked with snow, the glaciers standing out in unaccustomed relief against the black rocks, all due to the extended drought. Farther north there was more snow.

Soon the landscape became arid. Salinas appeared flat white in the valleys and absolutely barren hills appeared below us. By the time we landed at Autofagasta all was barren, sand accumulations flanked the steep fault scarp coast. Only in occasional washes could bushes be seen. Some slopes were dotted with cactus, very far apart.

Autofagasta rests on the coast south of a protective peninsula, cliffs and hills blocking it from behind. The sea was blue and only traces of swells marked it. On land not a vagrant blade of grass could be seen, only bare soil, pebbles, and sand. Water comes in to this considerable city by pipe from the Andes many miles distant. It is bustling and from what we could see modern. It is a major port for copper from the mines at Chuciquemata (the largest copper mine in the world).

Shortly we changed planes to a turboprop and were off again. Strand lines from many regular recessions of the sea mark the Mejillones Peninsula, just north of the airport. I suppose that along this fault coast these mark movements are occasioned by earthquakes. The extremely rapid elevation of the coast is very evident. The scarp is rough and jagged, without well-defined water courses in many stretches while above is an old erosional surface, nearly level and marked with well-defined stream courses that end abruptly at the scarp—cut off by its movement which has been too new for them to cut courses into it.

We stopped at Tocopilla, a nitrate port now suffering from the reduced value of nitrates (synthetics from the air have lowered the price). The terrain around is absolutely barren, while far in the distance one can see the white crests of Andean volcanoes.

It was only a short hop to Iquique.

This town of 80,000, once the major port of this area, and once part of Bolivia, is now a fading town full of Victorian mementos supported mostly by the fishing industry which depends solely upon the anchovy. It lies at the base of a steep scarp, perhaps 2,000 ft. high, above which is the pampa, or trackless desert. On the mile-wide bench at the base of the scarp is situated Iquique—which laps up the hill in a ragtag *barriada* [?] of shacks, most unpainted wood. Five big wooden tanks still farther up store water for the town which comes in by pipe from the Andes, just like Autofagasta.

It was a short hop to our hotel—the Arturo Prat—named after a famous naval hero. Prat died defending Chile in the War of the Pacific. When attacked by a Peruvian battleship Prat attacked a smaller ship and was killed attempting to board the Peruvian.

Snide word here has it that he may have been pushed off the bow by his own men, but it's best not to disturb such heroes in their fame.

Our taxi, full of luggage, took us into town along Baquedemo St., the main drag. The houses have old fronts, grilled windows, and many have widow's walks up top, some have towers. One hotel is the place in town right on the square adjacent to the clock tower. The tropical influence is evident—bougainvillea everywhere, palms, *Solanum* trees, and such. The hotel is old and gracious, in need of paint, clean and pleasant.

I called Louie Marcovich, my friend who set up most of the fishing along this coast. He came right up in his 12 hp 2-cylinder Camionetta and gave us a tour. Louie will return to the states in a couple of weeks to stay. Both he and his wife hate Iquique, even though she is a native. I can understand that in the long run, but for our stay it is interesting.

He showed us the 6 operating fish meal plants for anchovies—great stacks of bags out front of each, standing in witness to the huge catches. Peru last year took 10 million tons in the 52-day season.

He showed us “chippies”, the appropriate name for the local Madam's stash. He showed us the railroad switchbacking up the scarp back of town, and other sights.

We went to the Cooperativa where the gerente, another Slav, arranged for a 30-ft. boat for us—2 bunks and \$70 a day, including fuel and food. It will make 10 knots. We were amused that they almost caught us 2 Delphines (I think *Delphinus delphis*). The calderon (*Globicephala*) is abundant about 15 miles out, the marsopa lives close to shore. He gave a fine description of them blowing and am sure he was speaking of *Phocoena*. The killer is here occasionally, and *Tursiops* is found off shore. He was a little taken aback that I should want a calderon but agreeable that I should try.

After tea at the Marcovich's old, vault-ceilinged, two-story house, we headed back for the hotel and caught a guitar concert at the local auditorium. It too was full of fading elegance, the tattered curtain hanging over the performer, he in immaculate full dress and very good indeed.

Preparations for tomorrow when the boat comes in and to bed.

August 6, 1968

Iquique, Chile

The caballero at the hotel kindly forgot to wake us so we arrived at the dock a little late, hauling all of our heavy gear.

The mighty *San Mateo* (30 ft.) was there waiting for us. It is a narrow (7 ft. 6 in.) oversized double ender with a little low deck house, two bunks, a 25 horse Volvo diesel, and a tiller aft. The sternsman stands clutching two ropes, one going to each end of a crosstree on top of the tiller steering, another line leads down below to the throttle. Our crew consists of three men, Capitan Enrique Pierron, marineros rank y Mario. Good men all. Mario cooks glorious things on his midships primus stove. She's clean and the engine sounds good. There's no skiff though, so she's all we've got.

Quickly we loaded our gear after Enrique bought a little food uptown, and were off into the nearly flat sea. It's nearly always calm here we were told.

Enrique assured me that we would meet with the chancillo, which I now think is the bottlenose porpoise. We were also likely to see a “blackie” or pilot whale. It was

“café oscura” above and white between the flippers they said with a white mark between the eye and the dorsal fin (on only one or all, I wasn’t sure).

Past the big stone breakwater, with stacks of the anchovy reduction plants sending billowing plumes of white into the air.

We travelled all day, arriving home at dusk and saw one cetacean but were not able to get near it. It was medium-sized, perhaps 12 ft., with a small, sharp fin far aft, dark brown.

Many birds were seen. Big, white-bodied albatrosses reluctantly stirred themselves and ran flapping across the water until their wings locked in glorious soaring flight. Shearwaters flew by in great flocks, little phalaropes dabbled and twirled on the water surface, picking delicately at surface plankton. The kelp gull is here as are the tiny black petrels they called either “golondrina” or “bailerina” (ballerina). These little birds fluttered and circled like butterflies over the surface.

We heard a good many fisherman’s tales—about encounters locally with 30-ft. white sharks, in whose stomach was a tonina snapped in two (*Phocoena spinipinnis*). Killers were scarce here they said. Our skipper, who went to “Fishing School” in Valdivia came out with *Orca gladiator* so I guess we were thinking about the same animal.

On shore Vicente, the head of the cooperativa, had two toninas for me, caught by gill net fishermen at 5 AM this day. Bizarre animals in some ways. These harbor porpoises are dark above with a broad band leading from the lower jaw to the pectoral of the same color. The belly is white with longitudinal striping around the vent. These things were hard to see on our animals as they had turned dark during the day.

The peculiar dorsal is very far aft. It slopes up from the back in a straight line on which are lines of little knuckles or spines, rough to the touch. The posterior fin border is convex and just above the anus. Flippers and flukes are large.

We could not photograph so froze one animal and flensed out the other, then trudged over to the hotel, had some dinner, and went to bed. Tomorrow we get up at 5 for a long day at sea.

August 7, 1968
Iquique, Chile

For a change our hotel desk clerk woke us at 5 AM. Soon we were underweigh to the dock in the darkness, heavy suitcases and packs on our backs. Our crew was already there and ready to go so we descended the anchovy-anointed steps of the dock and jumped aboard the comfortless craft. Through the silent harbor, out past the jetty, and into the smooth sea we putted. The boat is supposed to make 10 knots but settles for about 7. I looked back at Iquique. If one could paint stars with a brush, a single stroke, a dozen stars wide, along the water line would suffice for her. [?] Behind, the looming cliff and the faintest hint of dawn.

Enrique, our skipper, said we had to get out beyond the “agua verde” and had to go to the south, since the animals had gone that way. Agua verde is close to shore and from 10 to 30 or more miles wide. It is cold (12 degrees C.) and apparently rather lifeless as far as surface fish go. Beyond it the water clears into oceanic blue—they call it “agua blanca” or “agua limpia” and it is warmer (15 to 16 degrees C.). Tongues of green reach

out into the blue and when one travels the interface as we did one crosses patches of green from time to time. The animals like the border area.

We travelled and travelled. Nothing but birds and an occasional “azuledo” or blue shark. Mario the cook and harpooner says they cook the blue shark by soaking the meat in salt water since it is “muy acido”.

There is a magnificent petrel or shearwater here “el pintada”—with black wings and head and upper body and head, pure white below, marked with three white spots on the wings—a speckling on the back and tail.

Enrique tells me the red-tailed tropic bird and one of the petrels, in addition to the gray gull, nest on the pampa or desert near Iquique. The literature lists only the gray gull. He tells of collecting their eggs. I wonder if this desert isn't so austere that birds are relatively safe there, much like they are on an offshore rock.

On and on we went, out to sea and south. Mario cooked a Chilean cassela for us. It is a sort of soupy stew of hunked corn-on-the-cob, beef bones, potatoes, squash, cilantro, garlic, and peppers. Good though.

Then the engine started acting up a little. Enrique went back and fiddled with it and it quit altogether. Thirty miles at sea, out of sight of land, three gringos and three Chileans in a small craft with food for the day and no skiff. Such thoughts crossed our mind. What a setting for a Steinbeck novel. The starter groaned and didn't catch. Enrique fiddled further. Groaned again as if it was just too much work to turn the reluctant engine. Next time it caught, belched carbon out of the exhaust pipe just aft of the cocina. Mario crossed himself in a flash and we gringos thought our thoughts of relief. Steinbeck retired.

At about 3 PM Raul, whom Enrique said had the best eyes on the boat, called out “blackfish”. He pointed in agitation to an absolutely unmarked sea. It was a long time before we saw them—spouts and tacks showing. They proved to be *Tursiops*, the bottlenose porpoise, a school of ancient old fellows, some probably 11 ft. long and weighing 900-1,000 lbs. I hit one just below the dorsal fin and the fight was on. Mario and Raul fought him by hand. We tried the buoy but gave that up since we could not maneuver near him with our boat. The braided nylon from the gun is terribly thin to pull by hand, and didn't allow us to pull him near enough for a blow with the hand harpoon.

I missed with a second line, which shot just over the beast's back, ricocheted over the water, bending the harpoon badly. After an hour's battle I tried again, this time without a line. I hit near the other and my shot went right through, bouncing over the water beyond. Still he fought on unabated.

I attached my last line and tried again as Mario and Enrique brought him close, straining on the nylon with their bare, tough hands. This time I hit him amidships and actually cut his heart as it later turned out. He died quickly and we then struggled to bring the 450-lb. beast aboard by hand. It wasn't easy but soon he was on deck. We turned for home, leaving a school of blackfish behind. It would be 2 AM before we reached Iquique. It had taken more than 5 hrs.

I saw the pilot whales (blackfish) stand up in the water as ours do in California, and saw them slap their flukes as they passed. I wanted desperately to see them but said nothing.

The long, long trip back was spent measuring and flensing the animal. A bloody hard job in the light of a coal oil lantern. I had blood and gobbets of meat everywhere.

Enrique was happy though, as the blood had poured out his shark lines and the smell brought fish. Furthermore he had a mountainous pile of bait in all my leavings.

About 12:30 I climbed on top of the deck house, zipped up my coat, pulled down my knitted cap, lay my head on a pile of bloody manila line, and went to sleep. Tomorrow, work ashore and some beach walking.

August 8, 1968

Iquique, Chile

Today we spent ashore getting things straightened out—lines coiled, harpoons straightened, batteries charged (on tape recorder), assorted parts pickled, animals photographed and flensed, clothes cleaned, and bills paid.

Once these things were done we made for the old whaling station south of town via taxi. It has been closed for 3 years but seems in good shape still. The afternoon was beautiful—sunny and calm but cool and pleasant. As a matter of fact, the cold Humboldt Current makes the climate here exceptionally mild and pleasant all year. No rain though. We deplaned at the station and wandered down to the beach. It was covered with a wrack of seaweed, old baleen plates, and whale boes. There were many sperm whale teeth amongst the pile so I had a field day recovering ivory and my pack was burdened down before I had ventured 50 yards. Further down the beach we came upon many intervertebral discs that would make good hot pads or saucers. More load.

The mountains behind drop in a single sandy scarp into the sea. A big tan dune mass stands nearby where the cliff recedes from the shore. We walked on through sandy coves and rocky headlands, looking for porpoise bones. I found two vertebrae of a *Phocoena* and that's all. We marched on into the gathering dusk—reddening sky and calm sea.

Before long our packs were getting a bit heavy and Beiret and Ken flagged down a local fish spotting pilot who gave us all a lift into town in his car. Nice, clean-cut fellow who spoke good English with a German accent learned in Chilean schools.

I went down to the dark docks amongst the old rotting nitrate sheds, and found Vicente, the head of the cooperativa, who opened the fish market where I flensed out the last animal. Back at the hotel I cleaned up and found Kenny in the midst of the last harpoon line moaning at the rat's nest of loops and tangles.

Off to bed. Tomorrow out for blackfish.

August 9, 1968

Iquique, Chile

On board the San Mateo at 6 AM and off a bit to the north following a tip from Vicente that blackfish were seen 1½ hrs. out. We didn't see them though. In fact no porpoise or whale broke water near us at all. And none were onshore waiting for us.

Enrique said the water was never right even though we went 35 miles offshore. Enrique is a bright, entertaining guy who has spent some time in school (Concepcion)—fisherman's school and one year in the University in Marine Biology. Every once in a while he breaks in with a latin name. Especially, however, he entertained us with the fisherman's secret language used to hide intentions during bargaining with outsiders. He learned it as a child. It's like a Castillian pig latin. Syllables are dropped or transposed

and it is utterly unintelligible to me. It is called Caraganza, and he says every fisherman in Chile knows it but he doesn't know if it goes into Peru or not.

A word about our crew—Mario is the older, perhaps 40, tough as rawhide, with a thin, muscular face, Errol Flynn moustache, bright, small dark eyes and swarthy skin. He can haul on a line for hours, it seems, without tiring. He is a helluva cook on his single burner stove. Casuelas come pouring out of his shoulder-deep galley pit, along with steaming mugs of heavily sugared coffee or tea and other good foods. The chicken of today, however, had led a rough life and was in the chicken olympics running the mile. Flavorful but nearly impregnable. I was literally unable to dismember it by hand.

At dusk we came in. I had heard of a restaurant called La Canada that serves Peze Sapo or clingfish as a specialty. This is the world's largest clingfish (*Sisyogaster*) and is found locally clinging to rocks above high tide. It can live out of water for about 3 days. It is considered a delicacy here and brings a very great price (escudos for one fish—about 50 cents). The fish may weigh $\frac{1}{2}$ to $\frac{3}{4}$ lb.

We hopped in a cab which took us through town and out on a peninsula south of town to a frame building, vaguely green where the paint hadn't peeled off, light pouring out the door onto the crushed shell street. Inside was a high, vaulted room with a couple of unshaded clear bulbs hanging down, several very indian people standing around drinking beer. Behind one glassed counter an indian woman sat knitting amidst a gaggle of dirty children. Tattered tables and chairs were scattered around under menu signs written in chalk. Peze Sapo wasn't even listed—I found because the price was so high—10 escudos for a meal, or \$1.20.

In the back were several private booths that looked more like a house of ill fame than a restaurant. Each had a table and chairs, a curtain door, and crushed shell and dirt floor.

As we sat down somewhat uncertainly I thought how Boyd Walker would have enjoyed this to the last crumb. We ordered Peze Sapo and beer (later a bottle of good white wine—bien fria). The cook emerged from the cocina and fished three squirming fish out of the glassed cabinet, and went off into the kitchen. We made a pilgrimage to the cabinet and found it filled with live fish clinging to each other or to trays—wholly out of water, but could see by their clear bright eyes and occasional movements that they were alive. This beast is certainly one of the ugliest creatures living—a giant tadpole with a lumpy skin, big fleshy lips, spiny opercles and funny short-rayed, inefficient-looking fins. We understood they looked up at you out of the casuela and sure enough, when they came in porcelain trays (like bedpans) a little while later, there was the fish, all purple now, peering up glassily out of a rich orange brown broth, a crown of onions, peppers, and sea urchin gonads, lavishly slathered over him. It was absolutely delicious. The sea urchins made a sauce par excellence and the fish was meaty, tender and delicious. We all stuffed ourselves, caught a microbus a few yards down the street for 1.40 escudos for all three of us and got off at the hotel content to go to sleep and digest. What a meal from what a seedy restaurant!

August 10, 1968
Iquique, Chile

Louie Marcovich came in early this morning and helped us round up a taxi driver for the day, since the San Mateo is preparing for the trip to Autofagasta we will make

tomorrow. Ken and Beiret and I decided to spend the time looking over the pampa, or Atacama Desert, above the cliff back of Iquique. Our driver, Victor Corrales, had a bright shiny Impala and a modestly outlandish price for the day's drive to Pica and back (\$35.00).

So, off we went, up the road that switchbacks up the cliff, and over into the incredibly barren pampa.

I was at once struck with the effect of a total lack of rainfall upon the terrain. The hills are rounded and relatively featureless. It looks to me as if old water-eroded terrain has been filled in and smoothed by wind-blown sand and soil for one can see the dim outlines of streamcourses down slopes and in valleys but filled and smooth.

Not a plant was to be seen. Not a blade of grass, a cactus, a belly plant, or even any living thing. The ever-present cloudcover of Iquique had gone and the sky was utterly blue. I suspect one can read into these hills the story of past climatic change, probably of Pleistocene age, when water did play a part. Now, even the long-lived seeds of desert plants are dead. It's clear why birds can find safe nesting grounds here. No animal, not airborne, can afford to search away from the areas of skimpy vegetation that do exist in places, especially around salt flats when saline water does occur.

Our good paved road led us past a couple of well-guarded checkpoints (Arica to the north is a free port and much smuggling results). We stopped at Humberstone, an abandoned salitre [?] city, complete with streets, houses, churches, schools, there at processing plant, and acres and acres of junk. It has been dead for nearly 50 years.

A few families live there, helping to reclaim pipe scrap iron, building materials, etc. As we walked through the abandoned streets, a few dogs followed us yapping. I looked for native life and found some birds—a flycatcher, pale as desert birds generally are, and the ubiquitous English sparrow. We chased a lizard in the dead and dying trees of the tattered plaza and then stopped to talk to a fat jolly matron leaning on the picket fence in front of her house. We could look in her door and see its sparse furnishings as she talked.

One decoration especially, struck us. She had a large nude photograph on the wall, in color, the model holding roses over the appropriate places. But the head had been replaced by the head of the Virgin. With what reverence do they treat their religion! While we contemplated this unusual icon she told us that there were foxes and rats and some big lizards in the region. At the moment this seemed hard for us to believe.

Every time our driver stopped he broke out his dust cloth and cleaned his car. It was absolutely shiny and spotless. I felt like some kind of criminal bringing my dusty feet inside.

We joined the Interamerican Highway—a fine, paved road—and shortly entered a “tamarugal”, or experimental forest using a relative of the mesquite tree. In 15 years after planting these trees were 30 ft. tall and shedding seeds everywhere, as well as shade. Sheep grazed under the trees. The trees are planted around salt areas where there is salt brine and salt rising from the ground. Also common in these places is *Distichlis*, or saltgrass, sometimes growing up in mounds 8-10 ft. high. I noticed the burrows and scats of some modest-sized rodent—much like those of the kangaroo rat. A large lizard with neck collar of brown and a tan body not unlike a low-slung *Dipsosaurus* was seen several times amongst the tamarugas or sunning itself on the caliche. Probably this tamarugal

will prove valuable enough to be a commercial way of raising sheep here, as well as wood.

A word about the nitrate deposits or salitre. It occurs as caliche, or layers in the ground and is very hard. The stuff is simply ripped from the ground with bulldozers or shovels and loaded into trucks for processing. The Guggenheim process is used, whatever that might be.

Rather shortly we turned off across the broad, long valley through utterly barren country toward a straggling patch of green set on an absolutely barren scarp. I think I could see the marks of a long fault and suspect the springs at Pica are along this fissure. This seems likely as the flow is pretty large and never varies.

We skirted through town—all bouganvillea, morning glories, and some kind of yellow flowering tree. Orange and mango groves are everywhere and scent the air. We ended up at the little hotel, stopped for a bite to eat on the porch under a bamboo ramada.

A group of German people, including Papa who looked straight out of Bavaria, talked a bewildering mixture of German and Spanish.

We wandered down to a nearby pool where a group of young girls were swimming. I chased the local lizards but found them extremely noose-shy. Later I learned this was because the local kids collect them by throwing stones at them. I gave up and inspected the pond. A nice-looking, aquiline-featured chap came up and I asked about frogs and toads in the pond. (Frogs common, good to eat, toads either absent or rare). He turned out to be a French-Canadian priest headquartered at Victoria. The girls were his charges and all were out for the day. There were two priests in his parish covering most of northern Chile, an area the size of Belgium, he said.

The ride back was more or less uneventful except for a lizard chase in the tamarugal. Our driver was anxious to get going, I think because he didn't want to get his car dusty in the dust devils. We stopped him anyway at a tamarugal and went lizard hunting. Under each tamaruga there were lizards. They were skittish, but not so much so as they had been at Pica. They retreated under caliche shelves into large, interconnecting caverns. Moosemeat and wife cornered one and I noosed one. They have a collar and a modest dorsal crest and no femoral ones that I could see on brief inspection. They are dun colored with the male being darker and about 10 in. long.

Back in Iquique we paid our driver his 300 escudos, at which he looked very glumly, why I can't say because it is excellent pay around here and taxistas usually don't expect to be tipped.

Tomorrow out to sea.

August 11, 1968

Drifting at sea off Caleta San Marcos

My birthday and what a way to spend it! I did get a present though—Enrique gave me a splendid set of foul-weather gear. Things started out inauspiciously enough, with all sorts of trouble getting the skeletons out of the freeze box. Then, just as we were about to shove off in our mighty felucca a rope got caught in the screw and we spent a jolly time trying to cut it loose. Enrique insisted on some spare oil, which I liked, but finally about 10 AM we made it out of the harbor.

I spent lots of time talking to Enrique who speaks very clear Castellana for us Yanquis. He can, however, launch off into the well-nigh unintelligible patois of the fishermen when he wants to.

We have some jugs of water, a little food, no lifejackets or skiff, an engine that seems reliable but has to be stopped every six hours for additional oil (the gauge doesn't work), two bunks for 4 people, and all my dead porpoises.

We skirted the coastline staying within the *agua sucia*, a markedly greenish water with poor visibility. It has much planktonic life as we could see from the phosphorescence at night and there are many bottomfish and fish in bays, but larger forms like albacora (swordfish) and porpoises and whales occur outside in the *agua blanca*, which comes in variable distances from shore and is markedly warmer. It is clear and nearly oceanic in appearance. Why should it support the top of the food web when the seemingly richer water does not? Enrique reports that almost never is *Tursiops* or *Globicephala* found in *agua sucia*. Enrique reports that the merluce (hake) does not occur either at Iquique or Autofagasta but does at Coquimbo, along with langostinos and camarones. Thus the waters of Autofagasta and Iquique probably support the same marine mammal fauna in general.

As we cruised along he told me of this shipwreck off Talcahuano when the ship capsized and he came ashore 7 hours later sans clothes and with no idea of how he had done it. He told me of spearing an *Orca* near Isla Santa Maria near Talcahuano and feeding its flesh to the dogs of the island, who promptly all died.

On down the steep coast we went, cutting close to points and slicing far out across the bays. Every six hours Enrique stops the engine to put oil in it and then it goes "runnk", "runnk" very slowly before it starts and I wish Mario would stop crossing himself when it starts.

The flight of seabirds fascinated me as it has many another naturalist. Why do so many such birds glide with their wingtips within inches of the waves and how do they manage to stay above the surface without touching it? It looks to me as if they do not touch the water, or else they would leave wakes where they touch and they do not as I could see when they flew close.

The view from the San Mateo is especially good because one is only a couple of feet above the surface and birds swing within a few feet at times. The wingtips are closest to the water—within an inch or so and highly sensitive to its position. The body is higher [drawing].

I suspect the wingtips "feel" the proximity of the water because of the moving air a few centimeters above the surface and that having the body a few inches higher allows the animal to move its head about while judging its distance from the water.

Enrique decided to make an anchorage in a little caleta (bay) called San Marcos. It was pitch black as we slid around a point he said was called "El Sombrero" toward the anchorage. We felt our way along, groups of sardinas shooting away from the bow like underwater fireworks.

Dimly I could make out white marks through the fog, glowing very dimly in the dark. On and on we went. I saw white patches growing near which Enrique thought were schools of fish but turned out to be foam flecks.

Raul and Mario were talking faster and faster in the stern and finally without Enrique asking them to they turned the boat rapidly around and headed out to sea. The

spanish rose in pitch and volume as we continued southwest. This I didn't like. The captain didn't control his ship but only argued with the crew. I didn't want to even be a witness so I went below while the argument continued. Finally Enrique came and tentatively stated they had decided it was safer to drift at sea. I readily agreed. So 5-6 miles out, with no lights, with a sea anchor astern, we are drifting along at the conclusion of my cumpleaños (birthday).

Raul and Mario hauled out two mattresses which they said were full of plumas de canarios (canary feathers)—but were actually full of straw. With ponchos and sparse blankets they bedded down on deck while Enrique and I did likewise in the tiny cabin. As a last parting thought for the day Enrique had tried to light a light with the spare battery and it glowed most dimly. The reserve I thought we had was a weak reed indeed.

August 12, 1968

Tocopilla Harbor, Chile

With the first streaks of dawn, the rocking ship awoke, the sea anchor came in. All night I had rolled and pitched in my bunk, bracing with elbows and knees in the swell. The *San Mateo* is really little more than a big canoe and it rolls a bit. The motor caught quickly, Mario heated coffee and we were off, dimly in sight of land through the haze. On down this incredibly barren coast we went, past guano-covered headlands, some with a scattering of big black *Otaria* clinging to steep rocks above the heaving sea. I counted over 100 for the day. Guano is scraped and blasted from the rocks, heaped, and either carted off down perilous trails, or loaded into skiffs.

Between points we cut out to sea. At one point, several miles from land, we came upon groups of feeding giant squid or jivias, which Enrique said were very dangerous to a man overboard. They flapped wings above the surface, and occasionally jumped. I judge them to be 4 ft. long or so, including tentacles.

As we neared Tocopilla the shore became a single near-cliff rising perhaps 1,000 ft. One could see the marks of shifts in the fault by shear lines and truncated slopes. Cactus began to appear—a large, arborescent type standing in very sparse groves on the steep slopes. Enrique said there was a kind of mesquite there too that had seeds used for rattles for the “wawas” (babies).

I learned a good deal about Enrique's life, his plans, what it was like to work in Iquique, etc. He was having trouble with pulpos, (meaning octopus), who are the fish dealers and who were keeping him from getting an engine for his new boat.

At dusk we came to Tocopilla after a rough, windy traverse. The town is a nitrate port (salitre) and handles some copper ore, too. It is tucked in a cove of the cliffs. Its waterfront is bright and new. Three big freighters were at anchorage.

Houses sweep up the hill in orderly rows, steam belches from the fish reduction plants.

We decided to anchor there and start at 2 AM when the seas were calmer.

August 13, 1968

Mejillones, Chile

I lay in the sack as the *San Mateo* started out in the dark. It was a rough, cold passage with poor Raul taking the brunt of it while Mario lay curled up under his Japanese nylon tarp and Enrique snoozed in the bunk next to mine. I, personally, scratched my

jerjeles bits, picked up on our beach walk. Kenny Bloome is an even bigger mass of welts. These jerjeles are a “no see um” that lives in the kelp wrack on beaches and undoubtedly we had picked them up on our beach walk. They leave a nasty welt that won’t go away for 5 days or so and they hide in clothing. In summer they get so bad people are hospitalized with them and there is a special ward in the Iquique hospital for sufferers.

Around dawn I hauled myself out for a cup of coffee in the stiff cold breeze.

More coast of an austere sort, a single sighting of a *Phocoena* slicing away from the bow and disappearing, and before long the seas began to calm as we reached the arc of Mejillones Bay. Shortly it was flat calm and we could see 5 anchovy seiners in a set, their nets up like tents in the power blocks (called powerbloc in spanish). One was a South African whom everyone hated because he would set inside another person’s set, stealing all the fish. This time he had all the fish, too, though perhaps gained in a more gentlemanly manner. We watched as the anchovies were pumped aboard in a glittering stream into the hold, gulls squawking in wheeling hoards.

As we came deeper into the calm bay we began to see harbor porpoises in twos and threes, dark backs with peculiar fins silhouetting against the light. We saw ten all told, all fairly close to shore.

I was fascinated by the little petrels they call bailerinas. Here you can see why they get their names. They run and pirouette on the water, using their wings in graceful fluttering to keep themselves aloft—all the while dabbling at the surface with their beaks.

On the dock was a *Lagenorhynchus obscurus* (southern striped porpoise) from a school of 200 or so. It had been caught in a net and partially dismembered for food. I got photographs of the remaining body and skeleton.

Once ashore I looked for my compadres whom I expected to be present—but no one was about. I made reservations for everyone at the best—there are two—hosteria in this graceless fishing village. The hosteria sits right on the beach and seems reasonably clean though nearly none of the plumbing really works.

Raul, Enrique, and I set out on foot to try to obtain a shipping box for all the porpoise parts. Enrique thought we could get two tea crates and stick them together, but there was none such in old Mejillones. We walked the sandy streets between ramshack storefronts, many made of eroding corrugated iron salvaged from the salitre ruins. Finally, far out in one end of town, we found what we wanted in a fish meal plant. These deserve descriptions. The anchovy boat stands offshore and is connected to the plant by a big suction hose. The fish are sluiced into cylindrical mills and oil is pressed off. Finally the smelly meal is sacked and the oil put in big grubby drums. The residue of blood runs onto the beach at the edge of the sea amid thousands of screaming gulls and pelicans turning the water red for dozens of yards. The stench of all this is pervasive. In a shed dozens of girls were filling big barrels destined for Spain. Layer upon layer of fillets were laid out radially, a layer of salt put on and so on till the 5-ft. barrel was filled a few inches above the brim. Then it was pressed down with boards weighted with heavy stones and capped.

We found our box amid a pile of new machinery, received permission from the plant superintendant and walked off with it in a wheelbarrow. There, coming down the street with hands waving, were Leanne, Kenny and Beiret. They had put up in a fisherman’s shack as all rooms were full, they were told, at the hosteria. Of course that

was because I had them reserved. Soon everyone was settled, Leanne instructed on the recording techniques (she will try for records of the *Phocoena*), dinner of porotos (beans) and assorted vegetables and nameless hunks of meat plus some grand fried fish (cojenol—a shad). To bed.

August 14, 1968
Santiago, Chile

A day of travel tangles—the plane had a bad pancreas at Autofagasta and I had to wait 5 hours and thus did not get to the Corroenio office. I had the eeplus from too much wine (drowning my sorrows) in Autofagasta so spent the night in my room reading *Time Magazine*.

August 15, 1968
Renaca, Chile

Up this morning feling a bit droopy and uncertain about my interior. I think, however, that it will recover in good style. All offices were closed for a “fiesta of the dead”—everybody visits the cemeteries. I asked the man in the hotel what the best way to go to Valparaiso was and he suggested a micro which was coming to the hotel in half an hour. It was “muy barato” he said. It was a shiny new Mercedes bus and I thought it odd that there was a microphone up front. A few blocks out the man demanded 65 escudos—it costs about 8 by train. I was on a tour that would return to Santiago later in the day. Too late now, so I got a nice guided tour, peered at Aconcagua (nice), went through Quillota where cherimoyas and avocados grow in everyone’s yard. It was all new country and interesting but hardly what I expected. While the tourists were having lunch the bus driver took me home. Glad to get there and find everyone well and happy. Unpacked and rested the rest of the day.

August 16, 1968
Renaca, Chile

All day spent writing letters, reading manuscripts, and untangling expenses.

August 17, 1968
Renaca, Chile

A quiet day with the family. The rest of the crew came in from Autofagasta. They had obtained two more Burmeister’s porpoises and had spent a day at sea during which they encountered sperm whales and *Lagenorhynchus obscurus*. The sperm whale had come over to investigate them, rising part way out of the water within 6 ft. of the rail. Leanne recorded about ½ hr. of superb recording showing different kinds of sounds simultaneously from one animal. The crew were frightened for the boat, which was about the same length as the animal (30 ft.). The porpoises are coming down by refrigerated truck. Everyone stayed for a good steak dinner.

August 18, 1968
Renaca, Chile

Sunday—all the kids are home. After a morning of desultory writing on my book we went for a ride north of Quintero to a little village called Ventana (there is a natural

bridge there). All manner of goodies were gleaned from the beach including a nice live dead penguin, which we left on the sand. We hiked out to a rocky promontory and watched the waves rush into spume and boil into kelp-filled inlets.

I cooked some merluce and lenguado—both are good fish. The merluce is very cheap here but of low esteem because of worms. Cooked, who cares? Answer, most people, I guess. That's why the price is so low.

Now follows a series of days at home. Most was rather uneventful—the usual round of dealing with the tradesfolk, little discoveries like a new mercado in Vina where one can buy lovely produce and fish, work on the book, work on house plans for Hawaii, a little fishing with Dick etc. etc.

A few things stand out. We went to the Stanislavsky ballet in from Russia, right in the middle of the Russian invasion of Czechoslovakia and wondered if the audience would boo or demonstrate as feeling runs high against this act here in Chile. Especially I wondered if Leanne would but she behaved herself. She is a romantic person in many ways and highly incensed over the Russian act, but perhaps our stolidity suppressed her. The ballet was full of technical excellence in the classic tradition and full of schmaltz in their attempts to be contemporary or funny. Fun though.

Then, Leanne invited us all to the “circo celin”, a one-ring, one [?] circus, set up down in the river bed. Phylly was feeling a bit low so she stayed home while the kids and Leanne and I went off to the Circo.

It was well worth the price of admission (5 escudos, however much that is). When we arrived about 2 people were gathered around the ticket booth, of which 18 later proved to be circus employees. After some time a bubble gum chewing fat little girl of about 13-14 waddled into the booth and sold us tickets. Since no one was going in we too waited outside while 5 majestic musicians whipped up a little music to draw the customers in. They had a drum which sounded like a wet laundry bag when hit, 2 flugelhorn, a trombone (played by a guy with gloves on), and two trumpets. They were unbelievable—strictly unbelievable. But they did make noise, which was the object.

Finally we went in. Our seats were right by the ring. No one else was there except some little kids and a majestic goat. We went over and met the goat, whose name was Pepe. Pepe chewed straw with a rhythmic relentless rotary motion while he solicited scratches from us. He smelled but we liked him. That obligation out of the way I talked to the little boys and inspected the knots used to hold the tent up. The bleachers were held up with two rows of wooden poles, two to a pair, wired together with the main riser resting on the wires. I'd hate to be there in bleacher seats at a full show.

For 45 minutes we waited (it was scheduled to begin at 9:45 PM) while the orchestra tried to drum up trade to no avail. Finally with about 20 people in the stands they began. A modestly good trapeze artist was introduced by the gum-chewing little girl, now dressed in spangled tights and bearing a big baton.

Then came the goat, Pepe. We clapped furiously and he nodded at us. Then the clowns. Dick was convulsed every time one did a pratfall or slugged another clown. They jabbered on in Spanish and did more pratfalls.

Toward intermission I had noted on a pencil-written program tacked to one of the tent poles, we were to have some bulls. When it came, the bulls were of cloth with two people under them and 4 clowns were butted and finally when the bull was to be killed he

gingerly stepped out of the ring and sat down in two seats near Dick. Dick watched with unadulterated joy as the bull crossed both pairs of legs and refused to go back in the ring.

When we left at midnight a thing called “Ritmo y sensualidad”, featuring the little fat, gum-chewing girl, was coming on. We had had a family of acrobats including the little kid I had played with earlier. He was joyously bad and did only a back bend.

It was, we decided, a smashing success and the only circus in which each one of us could be a useful part without training. I should mention their other animal, besides Pepe—a grand dog who jumped through hoops and jumped rope.

Our other main adventure was going to jail. Susie, Leanne, and I were trying to buy a guitar as we just have to have some music around the house. We finally asked a man in a hardware store and he told us to check with the jail up on top of the hill, which we did. It was an austere-looking pile of stone. I went up to a guard and he said, yes, they did have guitars, and that I should give him my carnet and go inside to see them. Leanne and Susie and I all trooped into the jail through a dirt courtyard to the visiting room—all bars and gray chipping paint. There a gestapo-looking guard bawled into a microphone for Sebastian Guzman to come out of stir. Shortly he appeared, a tiny, ferrety little man with snapping black eyes and a sad expression. Later, for romantic reasons, we decided he was a mass murderer. He explained he had guitars but they weren’t complete. We asked to see them and he went back in the inner prison and brought out two—both inlaid, made of Oregon pine and ___wood—a very pretty Chilean wood. We snapped one up for 220 escudos—about ½ price, and besides, it isn’t every one gets a guitar made by a mass murderer.

Later, when I went to pick up the guitar, the guard took me inside the inner prison. The cons were playing futbol in the narrow cement central aisle. Up on either side went three tiers of cells to a vaulted glassed roof. Three hundred men were locked up in these austere lifeless cubicles—wow, it made my flesh crawl just to think about spending time in this place. I wished Sebastian luck and left rapidly with the guitar.

August 28, 1968

Caleta Agua Verde, Chile

This morning, Phylly took Leanne and I down to the *Explorador*, the research vessel of the University of Chile. We were scheduled to try for some marine mammals out of Valparaiso. Before dawn we loaded our gear into a slim, double-ended skiff, and clambered aboard while Phylly went home to tend the kids. Even in the harbor the 60-ft. *Explorador* rolled. Out in the first graying light we inched through skiffs and [?] and finally out into the big confused swell outside. It is cold, forbidding, and overcast, and rather rough. One has to brace constantly to keep from going over the side. All day we looked and saw not an animal. This, we are told, is the usual case here in winter. Very little in the way of marine mammals, save the resident herd of *Otaria* in Valparaiso Harbor, is to be seen. However, in spring and summer—January, February and the first half of March, the water has warmed from its present 12-14 degrees C. to 17-18 degrees C., and then the calderon (*Globicephala*) and the tonina (probably *Tursiops*) make their appearance in some numbers.

Eduardo and I went over his log for records. He told me of encountering *Orcinus orca* near Tacna, Peru. Everyone says there are many animals at Juan Fernandez Islands.

The sea was full of birds as we started out, with fewer and fewer as we went farther offshore. Just out of Valparaiso Harbor we passed a raft of Pajaro ninos—Humboldt penguins and shortly began to see probably three species of albatross, one a huge, old bird with a white body and wings dark above that is either a white-capped albatross (*Diomedea canta*) or a wandering albatross (*Diomedea exulans*)—we couldn't be sure which. At any rate its wings are so long they droop in flight—flexing as the animal beats its wings. I note that there is less camber than in smaller petrels and hence the body is closer to the water during wing beats. The wings are around 10 ft. in spread—a huge creature as it flies toward one—like Howard Hughes's giant, droopy-rotored helicopter that never flew. We also saw, I am fairly sure, the gray-headed albatross (*Diomedea chrysostoma*). The cape pigeon, or as they call it here, tablero, was very common—the beautiful black and white painted petrel with the black head we saw up north. They wheeled and circled around us all day. I watched again, and even in rough water their wingtips do not touch the water, but jitter up and down just above it, a centimeter or so away. I cannot think this is accomplished by sight—but instead by touch, only touch in air.

I wonder if we have two major formal areas in Chilean marine waters inshore—one a northern area going up into Peru and Ecuador, in which we find *Globicephala*, *Tursiops*, *Lagenorhynchus*, and another group to the south in which southern species such as *Cephalorhynchus*, *Lissodelphi*, etc., are found

In winter the northern group retreats northward while the compensatory movement from the south isn't as great, leaving a very sparsely populated, or even vacant sea in the center, as we now see off Valparaiso. Then, as water warms animals move south again in 16-18 degrees C. water. Farther offshore, say 200 miles, very likely the oceanic fauna is encountered and this is what is aggregated around Juan Fernandez Islands. Likely this is oversimplified.

We noted a 1.5 degrees C. increase as we moved offshore 40 miles today. Likely, this would continue and it may be that an offshore-onshore movement occurs too, perhaps to the exclusion of the north-south movement. Only tagging will tell for sure. Water mass data could give good hints.

August 29, 1968

Renaca, Chile

Before dawn the ship began its daily life after a night comfortably attached, sleeping, to its anchor chain. Anchor winches roared and clanked, auxiliaries began humming, and soon the rhythmic thrumming of the main engine. I lay in my bunk, waiting for the swell to begin rolling the ship—but it did not do so very much—the night had calmed the water and when I sleepily ascended the ladder to the bridge I could see it was gray and overcast but calm, only an undulating swell.

Captain Reyes takes me back to my navy days. He is two men. One gay, urbane—ashore, the other a no-nonsense captain, totally assured of his competence, expecting each toot on his boat's wains pipe to raise a marinero or two instantly. At dinner one brings him his bottle of wine which he drinks impassively at the same table with them, who are permitted none. I squirm a bit but understand that is a system of harsh, clear rules, designed to contain all types of men, transients, responsible ones, and irresponsible ones. The selections from the dockside are not always reliable.

When the Captain announced we had to be in by 5 PM and I wanted more time his eyes grew as hard as agates, his slim features set. Nothing I could do would change the situation. So it goes. I am a guest and must not push, even though, as happened this day, I am working with an animal unknown in Chile and don't want to leave.

As we cruised out over the continental slope I saw spouts far off on our port bow. As we drew near I could see that some were diagonal—slanting forward from the animal's head—sperm whales. Later I saw the unmistakable square snout and peculiar dorsal ridge that passes for a fin. The animals moved resolutely southward along the slope contour. They were divided into small groups of 2 or 3, spread over a mile or more of sea. Never would they let us approach very closely. Having determined that there were about 12-14 animals and that no other smaller species swam with them, we turned out to sea again.

Reyes says they often catch jivias (giant squid) on the continental slope too. Perhaps the whales know this too and congregate to feed.

Not long afterward, as we were keeping our watch on the cold wings of the bridge, dancing up and down to keep warm, Leanne shouted that animals were ahead. Sure enough, within minutes we were in the midst of a big school of *Grampus griseus*, the grampus. These big fellows look for all the world like an obese, high-dorsal-finned bottlenose dolphin, all covered with scars. The heads of many were nearly pure white and gleamed emerald green as they flashed by us underwater.

Like the bottlenose porpoise they often broke water as they swam along—often breaching $\frac{3}{4}$ length and falling back on their sides with a great splash. One animal would make repeated leaps, leaving a trail of splash marks on the water surface. Somewhat less commonly animals leapt clear of the water in arcing leaps, revealing their entire chunky forms and pattern. All were white below, grading in variable fashion into plumbeous gray laterally and dorsally. Usually the younger animals were the darkest. Some of the older animals were totally white on head and anterior flanks up to the anterior insertion of the dorsal fin and farther back laterally.

I got the impression that both pattern and scarring are involved. Anyone who eats squids, as these folk do, is bound to be scarred by the tentacles.

There were subdivisions in the school—we saw two pairs—a large and small animal together near a similar pair. We saw aggregations of older animals as told by their whiteness and some tight groups of 10-15 animals.

As far as I know this is the first record of the genus in western South America.

I tried to shoot one but failed. On the first shot the entire cannister flew out over the water as the line jammed. The harpoon fell short. The next shot I left to Mena, a crewmember. His too didn't run free and the animal escaped. I missed the last shot, firing low. They were difficult shots with the animal a long way ahead of the bow.

By this time the captain was getting itchy to head for port so I made the most of our opportunity by putting Leanne in the skiff to record. She and Ruiz cast off and were soon tiny bobbing forms on the sea surface, a long way off. When we retrieved them Leanne had recorded a variety of sounds, squawks, and barks and clicks, and one sound that may have been a whistle.

Ruiz entertained with some good Chilean guitar music on the way in. We arrived at 4:30, called Phylly, and headed for home.

August 30, 1968

Renaca, Chile

A day spent trying to get ready for Peru. The Convenio, it turns out, will not support us on this extra-Chilean jaunt, so we pay for it ourselves.

We took a nice hike up in the chaparral back of the house to stretch our legs. I was fascinated not only by the genera in common with California chaparral (*Rhus*, *Clarkia*, *Lupinus*, *Sphaeralcea*?), but also the ecological equivalents. There is a tree that looks for all the world like a scrub oak, but is not. It has highly aromatic leaves, unlike our form. A poorwill-like bird, a robin that's not a robin, a trilling bird that's not a wren-tit but has a long flicky tail and is brown, and an equivalent of our yucca, only it's a bromeliad—the life form is the same, the climate the same, and many species are different. We saw a white-tailed kite soaring like his namesake, bounced on Susie's lovely long pine log that springs one up and down like a diving board. Back home with a *Puya* spike over our shoulders, much like *Yucca* but with green, spiky flowers.

August 31, 1968

Renaca, Chile

The time on these days was mostly spent getting ready for our trip to Peru. Phylly and I will spend two weeks there collecting, with Leanne staying with the children. All the children and Leanne are scheduled for German measles except Dick. He and Berit are the only ones remaining who have had them, and Dick just an incubation's span before. We had to fill the coffers with money and advice on the care and tending of families of four, which took time. The Convenio has seen fit not to pay for our specimens or trip to Peru, so we will go, squeezing our money with unaccustomed firmness.

September 2, 1968

Lima, Peru

Off to Santiago by Automotor, the nice rapid train—and with darned little luggage, too. What a switch that is, and what a relief. It's like taking your pack off after a long hike—one raises up with the ease of movement. No kids and no luggage to speak of.

We settled various issues with the Convenio, picked up (and paid for) tickets and all the plethora of papers one needs to go out of and return to Chile.

We paid a visit to Fuad Yaru, a big industrialist here in Chile—he runs the country's largest woollen mill and the Robinson Crusoe Fisheries, which works local merluce, langostina (shrimp) and the lobsters of Juan Fernandez Islands. I wanted to see if somehow I could reach these islands and obtain collections. He was gracious, indeed, and said that the best way to go was to fly—a local airline makes the trip once a week or so. He said he could provide an introduction to his representative there who would help us obtain a boat and specimens. He thought I had best plan to fly my collections back as the boats have no refrigeration facilities. He hoped to learn more about the commercial fishing possibilities around Juan Fernandez and had brought a boat from France to explore these islands and St. Ambrosio y San Felix. I hope to obtain some information for him from my various ichthyologist friends.

On out to the airport we went where we waited for what seemed an interminable length of time before our jet took off in the dark for Lima. Three and ½ hours later we

were through customs and nicely ensconced in the Hotel Maury, a block away from the Plaza de Armas where Pizarro's body lies shrivelled up in a glass coffin. Our hotel is very nice and has grand food.

September 3, 1968

Lima, Peru

Today we began the motions of collecting data and animals and of getting our return trip arranged. Our first venture was to the Chilean Embassy where we arranged for visas which cost us \$20.00, not soles, but bucks. We will have to wait till tomorrow to get our passports back, appropriately stumped. How I hate to let anyone, however official, go out of my sight with my passport.

Then Phylly and I hoofed it 10 blocks down to the Natural History Museum where we measured and studied a small dolphin skeleton. I think it is a young *Stenella* since I was not convinced that the palatal grooves were those of the common dolphin. Instead, the pterygoid hamulae dropped in a smooth curve to the margin of the jaw, with no indentation. Tooth counts, too, were low.

We hauled our specimen out in the sun and photographed him. The folks at the museum were very obliging and took the skeleton off its mount so I could photograph the palate. Everyone has been that way here.

Then, we made our way out to Callao to the shiny new marine lab where we met Jorge Mejia, with whom we made various arrangements to gather animals. He will meet us tomorrow for a tour through the "Terminal Pesquero" in Lima, where they often sell porpoises. These come in by refrigerated truck from all over Peru.

Phylly and I marched around Lima, free as birds with no children to tag along bitching because we were shopping too much. We found a grand brass "tocador" or door knocker for our new house in Hawaii. It is an antique that the saleslady tried hard to pass off as new, and dawn her eyes, she had the boy in the back room polish it up like new—unbeknownst to me.

On our way back we visited a marvelous old antiques store with a marvelous old antique gentleman [?]. His store was full of Chimu goodies, including whistling pots and lots of Chimu weaving—all expensive as might be expected of relics 1,000 years old. We bought Nan Hackett a sample of this ancient cloth since she is interested in it.

After a grand dinner (pompano in black butter with capers and a lovely bottle of vino blanco) we went blissfully to bed.

September 4, 1968

Lima, Peru

After a sparse continental breakfast, Jorge drove up with his friend Sr. Guterrez, a very bright, pleasant biologist who is Jorge's assistant. We then picked our way down to the terminal through the back streets of Lima. As we neared the market the muddy streets became a mass of stalls crammed with every conceivable kin of merchandise—blocks and blocks of it—amidst teeming masses of people. In the vegetable sections garbage was ankle deep in places from previous mercados. We threaded our way among trucks, people, incredible jalopies, and vendors, and finally reached the fish section.

Every fish and shellfish they catch in Peru was spread out in stall after stall. Sharks of several species. Guitarfish dried and fresh, gervids, dried parrotfish, skipjack,

and bonito, cojenoe cureles, espejo (lookdowns), mullet, rockfish, several species of croakers including one big one like our white sea bass, and on and on. Finally we found the porpoise stall and sure enough, there was a *Lagenorhynchus observus* laid out, end to end. His head (the part I wanted) was in back as it was pretty undesirable. I got it for 10 soles or 25 cents. Pretty good for a new northern record 1,000 miles north of the last record I set at Iquique last month.

We hauled our prize off to the Instituto where Phyl and I photographed it, flensed it out, and then packed it in salt. I made arrangements with Jorge to buy more while we are up north. He will collaborate with me on a review of the delfinids of Peru eventually and thus is personally interested in our success. He is a nice guy, and I think, a good biologist. His work seems thorough and careful and I am impressed with his Institute, which seems well supported and at least as efficient as places like Scripps.

He will buy 5 of each species (3 in all, we believe), including 4 heads and one whole skeleton each, a packing drum, and salt and will hold them for my return.

I learned that the tonina or marsopa (*Phocoena spinipinnis*) is caught generally close to shore in corbina nets (about 2,000/year) that reach from surface to bottom and that the *Lagenorhynchus* may be taken offshore in drift gillnets set for sierra. The dolphins are not sought but simply caught and sold opportunistically. At Hauco, north of Callao many were taken, including what they called chanco—gray above with a modest snout and white below—which I take to be a *Tursiops* and that everyday at Chimbote one could find *Phocoena* coming in by 4's and 5's. Jorge said it was absolutely sure I would see them there. So, that's where we go. Jorge has provided me with a letter to his man there, giving me all facilities. We'll try to get to sea there, too, to see our animals in the flesh.

Jorge told of the calderon or pilot whale, which is sometimes taken at the Paita whaling station. It is dark gray overall except for a bright white triangular blaze mark between the flippers or a bit forward and it does have a grayish saddle back of the dorsal fin. Sounds like a cross between *G. melaena* of the eastern USA and *G. scammoni* of the west. The skulls look that way a little, too.

Phylly and I hooked a ride with Jorge and he let us out at the Plaza San Martin where we straightened out tickets, paid another horrendous airport tax, and hoofed it for our hotel. Having had no lunch we were most grateful for a seafood chowder and some coffee.

September 5, 1968

Chimbote, Peru

Up early and off to the airport. We arrived with much time to spare but finally about 8:15 boarded Fancetts prop plane for Trujillo. The flight was uneventful and even unscenic as the everpresent blanket of clouds covered everything but the distant mountains. We dropped through the haze to the short little field at Trujillo where a taxi driver took us in hand and delivered us to the Colectivo center.

There are signs on us as a member of a party of 5, plus driver, going to Chimbote. For 40 soles each (90 cents), Phylly and I got the two hour drive across the stark desert and the river valleys to Chimbote. There is much windblown sand on this mountainous stretch of coast including lots of well-formed barchan dunes. Just north of the Viru Valley we came across a remarkable dune resting on the shingle-covered flatlands. It was a compound barchan of large size—perhaps 2,000 ft. across the cusps, with a single

crescentic slip face, just like the small dunes have. Spawned from each of its lateral cusps were whole strings of small barchans stretching out ¼ mile or so from the parent dune. It's rear slope was a crenulated mass of interconnecting dunes [drawing].

How I wanted to stop to photograph, but the colectivo raced on. Soon we were in the Viru River Valley, site of ancient Chimú ruins. Now it is green and looks prosperous with corn, sugarcane, bananas, and vegetables. Up on the opposite bank the desert began again. It's not so stark as that of northern Chile. One can see drainage courses everywhere, and water erosional features, to be sure usually liberally dusted with sand. In many places the dunes were covered with the dark spring leaves of a bromeliad, a low wind-formed *Prosopis*, or mesquite relative, and in places clumps of a crawling *Cereus* cactus were all the vegetation we could see. Then, for long stretches little or no plant life could be seen.

Finally we sped into the grubby outskirts of Chimbote, barrios of unrelieved squalor. It got little better as we entered Chimbote. It has very few trees and is mostly of unpainted adobe or brick though some new modern buildings are evident. The street markets are dirty and the produce we saw rather poor looking. Over it all hangs the swirling clouds of steam from the stacks of the 32 anchovy meal plants. The aroma of fish meal pervades everything.

More than 2 million tons of anchovies were processed here last year. We holed up in the Hotel San Felipe, which is nice, new, and clean, and I might add, costs about 1/3 the price of our hotel in Lima (220 soles a day--\$5.50). It's been open 3 months, has about 25 rooms (numbered in the hundreds—ours is 202). We walked down to the waterfront and there we met face to face at first view with a school of bottlenose porpoises gamboling in the little surf. Phyl and I walked a circuitous path through fishermen's gill nets, along the noisesome strand until we found the Instituta Marina annex. Our contact was on vacation but three fine fellows took us in hand, especially Francisco Vasquez Pata, a biologist working on anchoveta.

Right across the street is the porpoise landing where we found a nice dead Burmeister's porpoise, waiting to be cut up and shipped to Lima. Phylly and I decked ourselves out with aprons and measuring gear and got a set of photographs and measurements while hoards of curious Peruvians ogled at us funny folk.

Francisco priced the animal for us and it came to 300 soles, which he thought was too much. I kept quiet for a change and think we will get heads free, plus other samples. It'll cost me 5 bucks or so, though, if I want a whole animal. We'll play the waiting game for a while. They say 4 or 5 come in a morning so we should have a lot to keep us busy.

Afterward we obtained a fine drum and 60 kilos of salt to put our materials in. Francisco thinks I'm a little nuts, but then, so what? I'll get my animals. So far it's been a porpoise a day.

Tonight I take Phylly to a real circus with sea lions in it. Then dinner and then bed for we are on the dock at dawn tomorrow.

I should mention a thing or two about Chimbote harbor—it is magnificent—the best in Peru. It is nearly ringed by rather high rocky hills and sea swell is blocked at the entrance by a group of guano-covered islands. I would guess that the nearly circular bay is 10 miles across, sand bottom throughout and shallow enough for anchorage over a very wide area. Flat sandy bottom goes for 40 miles or more offshore here, accounting in no

small part for the huge fishery. We'll try to get a boat here but there apparently are no swordfish boats to be had.

We didn't make it to the circus.

September 6, 1968

Chimbote, Peru

Our funny little Peruvian alarm clock stirred us out at 6:15 and before 7:00 we were at the dock waiting to see if some materials of either *Phocoena* (tonina here), or what we think is *Lagenorhynchus obscurus* (called chanco marino or chanco tonto). Neither were there, but the little *Phocoena* was still on the dock. We waited under the ramada where the porpoises come in until a fellow started to cut the beast up and retrieved the head, viscera, and such. I cleaned it carefully, labelled it, and put it in the big drum, all full of salt.

The ramada did a busy trade in a variety of fish species, chiefly a deep-bodied sardine-like fish called a machete. These are gill-netted in the bay and transhipped into smaller skiffs in large round baskets. Two men haul the baskets up the beach on poles over their shoulders. In the ramada there seems always clustered knots of people yammering in rapid spanish. Ragged urchins scurry about retrieving fish that fall from the baskets. Old tottering men shuffle around—also retrieving what they can. I think many of the children are orphans who live in the streets and sleep in corners on the ground. One thing, here winters are mild and it almost never rains.

The waterfront streets and beach are incredibly filthy—trash, human excreta, dead fish, and in the water a gray, swashing mass of scales, blood, and slurry from the fish meal plants. It's a raw, rough, wholly utilitarian town where life is rough, everyone urinates when and where he likes, and I suspect violence is common. Down in the high rent district, which is unaccountably downwind from the 32 fish meal plants, the streets and sidewalks have windows of fish meal covering them.

Pancho (as Francisco is called) took us through a fish meal plant that can turn out 2,000 tons of meal a day. It's an impressive stash of big cookers, dryers, steam plants, fractional centrifuges to take off oil and so on. It must have cost a very great amount. Out back the meal is stacked in rows of sacks 10 ft. high that run for hundreds of yards. The bulk of fish here is incredible when one tries to transform it to living, swimming fish.

Phylly and I decided on a hike down the long swam-backed strand at the south end of the bay. I hoped for some skulls on this uninhabited shore, especially of *Tursiops* (they are called bufeo here) since the net fishermen do not catch them. I suspect this is because of their refined echolocation capabilities.

Our walk was a very pleasant and leisurely hike down 3 miles or so of strand, a light breeze keeping things cool, sea birds, including two species of egrets, phalaropes, sandpipers, and plovers rising ahead of us. Offshore the boobies and terns dove in schools of fish. We found a battered harbor porpoise skull, some remains of the southern sea lion, and lots of interesting flotsam and shells. On our way back we talked to a weatherbeaten stubble-bearded old fisherman taking his catch of small sharks to market on his shaggy burro.

After a snack we did take in the Circo Ferias. It was very good in spots—a fine pair of gymnasts, a wonderful old French contortionist, some remarkable child aerialists, and an exceptional slack-wire artist.

Off to bed, pretty well pooped.

September 7, 1968

Trujillo, Peru

Before even reaching the ramada we found Pancho down on the beach dickering with a fisherman over the body of a striped porpoise (*Lagenorhynchus*). It had drowned in his gill net about 15 miles outside the entrance of the harbor and he had cut its tail off and brought it in.

We measured and photographed as best we could and then took him (for it were a he) out into the ramada to skeletonize it where the blood wouldn't get all over the lab. Soon we were surrounded with a pressing mob of babbling Peruvians, all watching and commenting on our every move. I won them over to some extent by explaining that later I would transplant a heart into the animal and put him back together again.

Finally we were done. I gave the heart to a raggedy old man who asked me for it. Then, there was some kind of signal from someone that we didn't want the meat and everybody dove—pulling and snatching at bits and pieces. In seconds it was all gone and miraculously the parts we wanted were left. At first, they reminded me of seagulls fighting ravenously over a bit of offal, but no, they had waited, every muscle tense, until some sign came that we didn't want the meat. More like disciplined dogs quivering until the master says it's all right to eat. I guess the law's effect is strong even though these folk might seem rude and lawless.

We salted our bones down, cleaned off the blood and made arrangements to send our drum to Lima.

Phylly and I then said our heartfelt thanks and goodbyes to Pancho. He had been gracious indeed and of great help.

Phylly and I then retreated to the hotel, packed, caught a colectivo for Trujillo. A colectivo is a car going to and from two set points—in this case Chimbote to Trujillo—and they leave whenever 5 people sign up which takes a short time. Our trip through the desert took 1½ hrs. and soon we reached the very gracious Turistas Hotel—all arches, red drapes and chairs, tile, and dark wood.

Then we arranged flights and walked the town. It is one of the most interesting old towns in Peru—ancient old churches, some dating back to 1513, with bronze bells slung on ancient logs, rude wooden barrel windows—everywhere are grills and great old doors with littler ones cut through them, so one isn't forced to swing open the big one. The post office has a bronze lion's head through which one drops mail. A quaint, rather quiet, and lovely town.

This is the area of the ancient Chimu and Mochica civilizations—with the huge old town of Chan Chan nearby. We found an antiquities shop and I bought a Mochica pot of a "Lechusa" or quail. It was dug from a ruin called Huaca del Sol nearby and dates back to the 8th Century AD.

A nice dinner and to bed. Tomorrow, Chan Chan and off to Puira.

September 8, 1968

Puira, Peru

As our plane didn't leave until about 3 PM, Phylly and I, after breakfast, hired a cab to drive us out to the ruins of Chan Chan, the ancient Chimu City set on the north

bank of the Moche River. It dates back to the 8th Century, and as such, is one of the oldest cultures in Peru. The ruins cover 11 square miles—more than modern Trujillo. They rest on the river bank and extend from the sea to the rather distant hills. All are adobe of some special sort, so hard it is glossy in some excavations. It is thought to have been mixed with cactus mucilage to achieve this hardness. We visited two temples, each surrounded by 14-15 ft. high walls 6-8 ft. thick and with an intricate maze of interior walls, chambers, and courtyards. Nearly every room had a different motif to the friezes—rows of sleeping pelicans, rows of flying pelicans, ground squirrels, stylized pelicans which looked like they had run into a wall at full tilt.

One temple was surrounded with 14 deep crypts thought to have been granaries and its motifs were two-headed dragons, every head eating something. One form chomped on the heads of mace-bearing soldiers. At one end of one temple a deep oblong pit was dug and its reeds and pools attested to a fresh water supply. Actually, the pit fed on the fresh water lens that so often floats on sea water where the two meet behind sea beaches. In this case inland fresh water comes down the Moche River valley.

Behind the village of partly fallen walls an aqueduct of grand dimensions brought water from many miles into the mountains to this city. In places we could see the ancient motifs had been colored buff, yellow, red. One temple was a ramped pyramid, perhaps a precursor to the grander ones at Teotihuacan in Mexico. The similarities in incised motifs certainly suggest such a lineage to me.

It's sobering to reflect that here was a society of great size and obvious refinement about which we know next to nothing.

Our pot, a refined bit of stylized art, comes from such a temple—which we could see across the valley to the south.

Back in Trujillo, Phyl and I wandered the streets in the warm sun looking in leafy garden courtyards, at the ancient studded double doors and wooden gratings on windows—altogether the most Spanish scene of any town we have visited.

Our airflight was a most interesting one. It took us up the coastal plain to Chinclayo and Piera. Much was desert, mostly sandy and barren but becoming increasingly studded with clumps of brush as Piera was approached. South of Chinclayo crescentic barchans were very prominent. Wherever a rocky hill jutted up it trailed a long streamer of sand NNEastward in the form of a single longitudinal ridge. At length this then began to break up into hummocks like dashes, which then became a string of barchans. Finally, farther away, if more than one such streamer was near, they coalesced into a sea of interconnecting barchans. In totality it looked for all the world as if the eddies and vortices of smoke streams had been frozen in sand. In many barchans one could see that they were markedly lighter than the substrate on which they moved—buff against a light peach color. In many barchans one could note a dark top—or turnip-shaped mark within the cusps and beyond—darker than either sand or desert. Scoured in some way by the wind I suspect, so the desert pavement shows.

The desert was a mass of ancient lines, straight as dies, intersecting at acute angles, each running for miles, often as far as one could see. On closer inspection many were double—like ditches, which they well have been. No modern agency made them, is my guess, and why ancient folk should have done so is an unsolved mystery. I had not heard of them being reported except in southern Peru, where they are much talked and speculated about. Often we could see marks of ancient walls and enclosures, nearly

buried in the sand. One gets an impression of large populations very long ago when the climate could not have been so austere as now.

Piera is in a river valley far out on a very flat plain, a short distance from the sea. The Humboldt Current weakens here as it passes out to sea and the climate is warm and subtropical. The town is heavily shaded with Indian beeches and algaroba trees. It's a rather sleepy farm town, close to the Ecuadorian border, so we "extranjeros" have to register with two groups of police to show we are not bent on some evil intent. Our hotel (the gracious government Turista Hotel) is right on the shaded Plaza de Armas and we were graced with a fine military band concert, with kids roaming in and out happily among the musicians.

Tomorrow—off to Paita, which is reportedly too small to have a hotel. It does, however, have a whaling station and a Starkist fish meal plant, plus a substation of the Instituto de Marina to which we have an introduction.

September 9, 1968

Paita, Peru

We were quickly cleared by the police as pure. They explained that they had orders to keep hands off the tourists. So we quickly assumed the guise of tourists. I found that we could obtain a colectivo to Paita and that there was a first-rate hotel—the Miramar—there. So, we quickly packed and left across the arid undulating plain to Paita. It's as arid as some of the more arid areas in our deserts—studded with Algaroba trees and bushy clumps of vegetation, some of which one of the people in the car thought were sapotes, but I doubt it. There is much drifting sand and pinkish desert pavement. After an hour we arrived at Paita, which looks for all the world like Santa Rosalia, Baja California, being set in an arid canyon with mud-walled shacks and unpainted wooden buildings. Unlike that hellhole, however, the weather is about as nice as it could be—warm and breezy. The port is ancient and picturesque. We located our hotel on the waterfront in an ancient dilapidated Victorian building—all gingerbread and diamond glass, three stories high with great hardwood balustrades, a special staircase, and huge vault ceilinged rooms. The two beds are lost in ours. One could skate up to the john. I'm sure it's cheap—I haven't found out. Next door is the best restaurant in town under a pleasant ramada.

We stashed our things and took off to find our substation of the Instituto del Mar. After much running up and down rickety stairs we located it right on the Plaza de Armas where it was supposed to be. We were greeted by a slight, affable biologist, Sr. Enrique Vasquez Sanchez. He quickly took us in tow and we went off to rent a boat. There are swordfish boats here and we are dickering for a likely looking one. Then, we walked down the beach and found a *Phocoena spinipinnis* skull stuck in the sand, and later what I think is *Tursiops*—a somewhat battered skull minus rostrum. Enrique said that *Lagenorhynchus* was here, as well as probably *Delphinus*. These he said, occasionally came in with fishermen. He seemed unsure that the pilot whale was here.

They have a nice little lab here in a new cinderblock building set on the bluff south of town where we went next to flense out the mildly noxious *Tursiops* head. The bay of Paito lay below a shingle beach berm and a nearly flat sandy strand that I feel drops slowly offshore, producing extensive shallow flats. It was calm, as we are told it nearly always is, though in the afternoon a strong offshore wind swept off the miles of

cooling desert flats above town, ruffling the water with williwas. The eternal cloud blanket of Iquique, Callao, and Chimbote is gone so the sun shines down through the clear water and at night, the stars shone and twinkled brightly for us.

Fishing here is done in a variety of ways. The bigger boats use a variety of nets—otter trawls, here called arastres, balloon nets, and seines. Quite a lot of gill net fishing goes on in smaller vessels. Sharks are taken by hook and line. Two major packing plants freeze fish—the merluce is important plus a variety of warmer water species. One fishmeal plant operates but not on anchovies since their range stops somewhat to the south—instead a variety of bottom fish are used. This large fishmeal industry is all exported—mostly to West Germany and the USA for animal food supplements, a typical and sad case in which a protein resource designed to alleviate poverty has been subverted to use by the “have” countries, the money flowing into the hands of entrepreneurs, many foreign.

The poverty here is extreme, as it often is in desert towns. Big barrios sweep up the canyons back of town—houses of plaited rushes or simply ramadas of sticks and mud. In them human smells assail one as a wave of odorous revulsion results. We saw that in similar places in Lima. Water costs these poor people as much as 33x the cost to central city residents—arriving in ancient tank trucks or in tins at so many soles a tin. Disgraceful, and clearly the place where selection now acts with great force. It acts elsewhere too, but in more subtle ways.

It’s hard to see how there could be 12,000 people in this port until you remember the barrios.

Disfigured and maimed people are common and the thought came to me today that being so maimed could be a fair trade-off for the poorer folk as it becomes a possible occupation to beg. The more bizarre the injury the better the stock-in-trade—certainly every effort is made by such folk to maximize the impact of their injuries. One man with no legs, trundling himself on a little square castor cart quickly assumed a prayerful pose when a likely prospect drew near. I gave him a sole and when we passed him again he whipped into his pose, like those pictures of Jesus on the cross, only to see in apparent embarrassment that it was just me again, whereupon the half-open mouth closed, the palms separated, and his eyes became those of an everyday man instead of a beleaguered soul.

Well, it’s very late as I sit here in this vaulted room, diamond shadows on the wall from the moon outside, sounds of surf on the shore, chickens crowing plus a few desultory dog barks. Tomorrow perhaps we will go out to sea to look for porpoises.

September 10, 1968

Paita, Peru

After some hemming and hawing about, with both Enrique and Fredy Franco dickering for me we settled on a price of 1,800 soles for two day’s work (or about 40 bucks). In a very short while we (Fredy and I) were on board the trim, clean little raft. Jose Pita and his brother own two boats of similar size, both immaculately kept. They have GMC diesels in them, are about 30 ft. long and very beamy. The Pita brothers fish in a variety of ways, mostly with gill nets though.

These are fine twine nylon but with perforated pieces of beach shingle for leads. I guess lead is expensive here, like it is at home.

Phylly wanted to stay ashore so off we two went around the arc of the big bay at Paita, close to shore looking for bufeo, or *Tursiops*, which the brothers said comes into feed on lisa (mullet). It and the little harbor porpoise are the two species that come into the agua sucia near shore. Others stay out 20 miles or more in clear water. The dirt comes from a river north of here.

We passed a neat little beach resort called Esmeraldas where the gentry of Piura come to swim in summertime. Shortly we came upon two Burmeister's porpoises swimming slowly along. Tiny animals that never let one get very near. These flicked their tails and disappeared, changing course underwater each time we pursued them. 50 yards was about as close as we got.

We cut back across the bay, hoping for *Tursiops* in the eel grass on the opposite side near the whaling station but no luck. Since we couldn't go far enough offshore in the time we had, Fredy and I decided to go ashore and work at the whaling station.

Fredy commandeered a ride for Phyl and I and himself in the Toyota jeep of the Japanese superintendant, a taciturn fellow who hardly gave one the time of day.

At the station, which sits on the arid shore a couple of miles south of town, we began work in the museum.

The road is a long, circuitous affair leading over the nearly completely desolate plain above town. One can see the cut layers of soil in the cliff face and the extreme flatness of the surface made me feel secure that it was rather recently seabottom and that a great, shallow bay extended nearly to Piera, probably in Pleistocene times.

Jorge Mejia had built up an interesting whaling museum which included a lot of whaling gear and pickled whale parts, stomach contents, and some jaws and skulls. We worked over the skull of a male killer which was said to have come from an animal found on the beach south of Paita. A male and female were found together, the male with a probably mortal wound at the base of its dorsal fin, as if bitten by another whale or a large shark. Later, up in their little lab above the flensing deck, Phyl and I worked over two more skulls, one the female of the pair and the other a huge, old male.

By the time we were done and had conversed with the superintendent, Georg Schmidt, it was nearly dark. Schmidt had put up my friend John Cushing when he was here studying whale blood.

Phylly and I had a nice dinner of halibut, a walk around the Plaza and the clubs from which Wurlitzerized music poured, and to bed.

September 10, 1968 [?]

Paita, Peru

In the dark I assembled all my things and pushed out into the dark quiet streets. Down at the pier a man was unloading sea bass and merluce into gunny sacks and over at the other little pier several lanchas were unloading fish into a variety of waiting trucks. For me, however, no boat was to be found. I asked where the *Estrella Luminosa* might be and most everyone looked blankly as they passed fish into the trucks. One man allowed as how it docked at the fish plant ½ a mile down the coast, which surprised me some as he was standing on the dock where it tied up yesterday. But, not knowing what else to do, I trudged off to the plant where a group of men were unloading a truckful of guitarfish destined for the fishmeal plant. No such craft there they said, most likely back at "Puerto Nuevo" from which I had come. So, off in the dark again down the dusty

road. Finally, after two or three more transits between docks, I finally learned that he hadn't come in yet and was probably offshore, fishing. It was pushing six by this time and light was beginning to show over the sea bluffs. The scene would have been picturesque if I hadn't been too angry to notice much—the old church bell tinnily clanging out the time I was wasting in frustration on the dock, boys with bicycle carts toting fresh bread from the bakery whose smells wafted over the quiet streets amidst more redolent smells, old women in black mourning clothes scuttling along with dripping bags of fish, and on the water, rafts of pelicans flapping and wheeling toward a boat where a young boy was cleaning the hold, every now and then flipping an ancient fish into the water into the flapping, squawking mass of birds.

I finally gave up and went back to the hotel for breakfast, took a brief nap on the front porch sofa, and walked wearily back—still no boat. I located his wife who informed me she knew I was to go out at 4, but he wasn't in yet, being out somewhere offshore fishing. She didn't know when he would arrive but thought soon. I hoped.

Enrique found me waiting and was incensed about the whole affair. He took my contract and carted it off to the port captain, who would issue some sort of reprimand. Finally the boat came in but no one came ashore, but instead sat picking and patching their gill nets on board. I left, said to hell with it, and had some lunch with Phylly. In the afternoon, Enrique, partly because I think he felt a bit of responsibility for us, arranged a trip to Playa Grande, a big beach to the south where we might find bones. Fredy and the engineer of the local fresh fish plant, Americo Rodriguez, Phylly, and I hopped in Americo's Dodge sedan and took off across the tablaza, the flat land between here and Puira.

This plain is gently undulating, but with no major washes or arroyos as far as we could see. It is reportedly covered with shells, even far inland. Here, there is little sand—one can drive almost anywhere across it—like driving on the bottom of a dry lake. Scattered about are low bushes here and there. We drove south about 15 km. And then dropped down a graded road to a little village of summer cottages set on a lovely crescent cove, rocky and rugged on both limbs but a smooth unblemished playa between. Fishermen worked on nets and one could see that their activities mostly concerned the mackerel shark, *Isurus*, as the nasty heads and jaws of this species were scattered everywhere. I wanted to retrieve teeth for Jerry Goldsmith but could not pry any loose.

We walked northward toward Paíta along a beautiful flat strand backed most of the way by an abrupt cliff some 200 ft. high. The same layers as seen north of Puira cap the cliffs here, and I supposed cover the entire tablaza. Below was mudstone dotted here and there with rounded boulders of fossiliferous sedimentary material. At the shoreline the sand often lay in a thin sheet over an extensive bench out in this same material. We watched the flocks of capuchin gulls (red beak and legs, gray capped heads and mantel) and the scurrying groups of red beach crabs. These crabs could detect us an amazing distance away—100 yards or so and would stop their business of rolling little sand balls in search of food and sidle away toward their vertical tubular burrows, down which they popped before we were very close.

I checked the wrack at the strand line for bones. About halfway in our two-mile stroll I spotted a *Tursiops* skull resting at high tide line. It proved to be a nearly perfect specimen—quite clean and odorless. The rest of the hike netted nothing more than exercise in the warm, sunny afternoon.

On our way back Fredy pointed out a coastal condor resting on a hilltop—a beautiful big bird with black wings and a white mantel—not so big as the Andean species, but noticeably bigger than the black vultures nearby. Fredy said they could carry off a young goat.

Back at Paita I stopped by the Instituto office to see Enrique and instead found Jose Panta, the fisherman, circulating around looking worried. He explained that the Capitaneria (Port Captain) had his contract with me and wanted to know why he had not fulfilled it. Jose said his crew had decided their lines weren't strong enough to hold a porpoise at sea. I agreed that they might not be. Why, however, hadn't he come to discuss the matter with me? No answer. The port captain wanted to know, he said, if Jose owed me money. No, I said, I had paid him 500 soles for about ½ day's work and that was enough. So we marched over to the port captain's office and got Jose off the financial hook. That was that. He had been reprimanded and that was enough, for me anyway.

Dinner, notes, and to bed.

September 11, 1968

Lima, Peru

Packing, a lunch for the boys, goodbyes, a lift to Puira by the hotel owner and wife, a wait at the airport, and off to Lima on LANSA.

Below us the gathering dusk cast its reddish haze over the dunes and marked them with dark shadows. Before we reached Chindayo the clouds had banked up and all was darkness. Much wiser than before, I refused the vulture-like throng of taxistas until, after the third question, I was given a price—about 1/3 what I had paid before for the trip to our hotel. They like to get both you and your luggage in before giving a price as they rattle along with their captives. Collectivas are the thing though. At set points cars wait and when 5 people arrive for a trip, off they go to another set point, usually for a very low price. For instance the colectivo from Lima to Callao cost 4 soles (10 cents) per person and a taxi 50-60.

September 12, 1968

Lima, Peru

At the Instituto I found 6 animals waiting—3 *Lagenorhynchus* and 3 *Phocoena*, all obtained from the Terminal in Lima.

Phylly and I spent the day preparing them and filling our drum which had arrived from Chimbote. We will leave Peru with between 18-20 specimens having been obtained—a superb record for 2 week's work, and especially from an area where essentially no material now exists.

We washed up and headed for Lima via the cheap colectivo, had a grand steak dinner, walked around town buying presents for various relatives, and went to bed. Tomorrow, Saturday, we will work again at the Instituto if material arrives from Huasco, between Callao and Chimbote, and if more comes in from the Terminal. My harpoon, too, is coming down via express, from Paita and may be here. If none of these things materialize we may head for home early.

September 14, 1968

Lima, Peru

Jorge called and two more porpoises had come in so we packed appropriate gear and headed for Callao, Jorge driving. We found two more *Lagenorhynchus* waiting for us. I prepared them and Phyl and I tagged and prepared the skeletons that Jorge had obtained while we were up north. I put everything in the drum, salted it down, and had the satisfaction of leaving the drum clear full of specimens and salt, ready for shipment to the Smithsonian.

It's a nice batch, and certainly the best dolphin collection to come out of Peru. Jorge will collect up to 10 of each species and ship them on. I will return whatever Dr. Ferrya at the Museo Ciencias Naturales wants. The rest will be distributed, mostly to the Smithsonian.

Phyl and I were getting pretty itchy to get home by this time and time began to weigh heavily. We walked the town, poking in shops, buying peanut butter (unavailable in Chile--\$1.20 a bottle here), a few gifts, especially carved gourds from Cajamarca and Huancayo, a knife for Nancy (Swiss Army with a magnifying glass, pens for Sus and Barb, and models for Dick). We ogled at pots and the silver-based scepters that local alcaldes used to use in Peru (4,000 soles).

I called Hersch Peak, my old Navy roommate, who is now Political Attache in the American Embassy in Lima. Unfortunately he returns on Monday from vacation and we will be home in Renaca then. Woe, woe, as I wanted to see them both.

A nice meal, a bottle of wine and off to bed.

September 15, 1968

Renaca, Chile

Our flight was delayed two hours while I fidgeted in the airport (Phylly tends to take these things calmly). Finally, after what seemed an utterly interminable wait, we boarded our plan (in from Hamburg) and headed south. It was so good to be underway. There's nothing like going home to make me anxious and with the delay it was even worse. Three-and-a-half hrs. later we touched down at Pudahuel Airport, hopped on a bus for Santiago, by hook and crook reached the colectivo stand where a pirate colectivo took us in tow—and then we waited, and waited while the driver tried to round up his fifth passenger. Finally each of us chipped in an extra 5 escudos and we were off. We reached home after midnight, roused poor Leanne (we had tried to call Leanne collect but somehow couldn't rouse the system into any kind of useful action). Three of the kids had had measles but the house was full of artwork, flowers, and junk, and all had obviously had a grand time. Grand to be back.

September 16-20

Renaca, Chile

At home during this time. The little store down the hill had been holding stacks of mail since they didn't know who K. S. Norris was and they were too lazy to investigate the address. We can throw a rock and hit them (and may) from our house! Great Scott—20 letters—some important, just lying there. So I answered mail and tried to straighten out accounts. I wrote some on the book and boiled up the *Ziphius* skull, a very smelly job, but good to get it done.

This was accomplished by setting up an oil drum in the sand at the station and building a fire under it, putting the stinking beast in, and then tending the fire until it was done.

We took a nice hike up back of Leanne's cottage—Dick, Susie, Phyl, Leanne, and I. We saw the beautiful Chilean lapwing, a big plover with a black belly, reddish epaulets, a gray back, and red legs and bill. It's a big bird, standing perhaps 1½ ft. tall. There was a pair and they may be nesting. We find that these birds are sometimes kept for pets and watchdogs. They apparently take no guff from man, cat, nor beast, and raise a ruckus if anyone approaches.

We also stirred up a pair of burrowing owls. When standing quietly they are barred all over, but after being frightened when they land, they do something to the angle of their feathers and become strikingly white as they bob up and down doing deep knee bends.

All the kids are pressing flowers now so we collected many, including a lovely yellow lady slipper and a nettle bush with pendant yellow flowers, red-tipped in their centers. I was stung for my pains, right through the callus on one of my guitar fingers. Hurts!—and won't go away.

Our hike took us through young stands of Monterey pine and across lovely grassy meadows.

September 20, 1968

Caleta Laguna Verde, Chile

Down to the *Explorador* at 6:30 AM where Leanne and I boarded on a jaunt to look for porpoises out in the Humboldt Current.

It turned pretty windy around noon and all afternoon the ship rolled in a choppy sea. The white caps all around made it very difficult to spot animals and though we kept a close watch all day, saw no animals, except birds.

In watching gulls and cape pigeons I marvelled at how perfectly their feet are folded up in flight and become part of the body.

Gulls fold their feet and tuck them up under the tail so that they are nearly perfectly flat into body outline. Cape pigeons are even better. I thought for a while that they raised their feet inside a feather flap, because no legs were evident as they flew—only the unbroken white body contour ending at the little short tail of dark feathers.

Actually, however, by watching them land on the water I could see the legs drop down from a position lateral to the belly, with the feet being held under the lateral margins of the tail and of the same color. At any rate the contour is remarkably well maintained.

As dusk came we headed back and the huge bulk of Aconcagua loomed pink over the coastal mountains. An otter trawler stacked her net, rocking in the swell, and darkness came, the Captain navigating in with his fathometer.

September 21, 1968

Renaca, Chile

A long day of watching in windy seas, my parka cinched up tight and thankful for my thermal underwear. We saw nary a mammal as the ship went 40 miles offshore of Valparaiso and returned in the evening.

All we had to enliven the activities were the birds, one shark, and a school of fish. But we did improve on our observations—the leg position of sea birds. A kelp gull flew by with two lumps showing where its legs ought to be and no feet. Aha, I said to Leanne, a gull who lost his legs and look he's perfectly healthy. We watched him for a long time and could tell him by a displaced primary feather. Later Leanne called me to the bridge and told me to look again. This time the gull had legs and no lumps. He had straightened out his legs so that his feet came out from under the feathers. Then we saw another gull with one leg protected and the other exposed. It's what you do if you're a gull and your feet get cold, I guess.

We arrived home, sunburnt and weatherbeaten and tired. It's hard work to look all day at a white-cap-covered sea trying to discriminate a porpoise splash or a whale spout from them.

September 22, 1968

Renaca, Chile

Writing at home and in the afternoon a drive to Bahia Agua Verde for a walk on the beach, and home up through the beautiful fertile valley above—all cows and green fields, with forests of Monterey pine on the hills above. The kids collected flowers which they are pressing. Barbie collected maidenhair fern stems for her basket. Back through the hillside barrios of Valparaiso, wondering how the people get water up there to their shack houses and what it must be like to live in them.

September 23-October 1, 1968

Renaca, Chile

These as mostly taken up with routine affairs, trips to Santiago to tend to expense accounts, routine at home writing and preparing specimens and getting affairs ready for the Valdivia trip and the expedition to the fjord country. We met with about 15 Peace Corps people here on various fisheries missions in hopes that they may be able to help us gather material of porpoises that happen their way. I think it will work.

I cancelled a possible trip to Juan Fernandez Islands because of lack of time.

On October 1 I delivered a lecture to the University of Chile, Valparaiso, in execrable Spanish. It went over well though, especially the question period where I answered in my pidgin Spanish-English mixture.

October 2, 1968

Valdivia, Chile

Having come up in the night on a colectivo and stayed at the Crillou, I set out this morning for Valdivia. We flew in a prop plane at about 5,000 ft. down over the patchwork of prosperous farms that occupy the entire central valley of Chile, while to the left was the magnificent snowcapped scarps of the Andes. On the west intermittently rose the lower coastal range—all rocky and chaparral covered like the hills back home. The further south we went the more tree farms were evident, on hillslopes and along the many rivers that braided their way across the flatlands.

As we neared Valdivia the plain stopped and moderately rugged hills rose beneath us, all clothed in trees and a spiny yellow-flowering bush (a Caesalpinaceous plant) that

splashed the slopes with color. Water became abundant, shining in lakes and rivers of silver.

The plane set down on a little country strip, and as always in these cases, one became immersed immediately in the local scene. What was above an abstraction of the environment became real and one could empathize with the parts related to one's experience.

In this case there was much to empathize with at eye level (ignoring the encompassing sky above)—it was the northwest USA in all its pastoral beauty. Green hills, farms and pastures, belled cows grazing, frame houses with steep roofs and diamond windows and Victorian gingerbread. Water was everywhere evident. Lakes and shallows with reedy borders or stands of white barkless dead trees [?]. Water-washed roadcuts, gullied and red, dark glowering stands of pine, arranged in blocks but nonetheless soft and cool and beautiful.

Leanne had arrived in the jeep and we rattled back to Valdivia in it. She had had the battery quit on the way down but everything was now going smoothly.

Valdivia is a quiet old town where one can walk across the street with a reasonable chance of making it before a car heaves in sight. The air is clear, the people have time to say hello and be friendly, and the area around is lush and beautiful. The Rio Valdivia, which is the confluence of two other streams, is light green, deep and swift, flowing disciplined between its two banks with nary a ruffle except on the rudders of the ships moored to the cement pier in town. Bluffs mark its course downstream.

We put up in the Hotel Schuster, a place of faded and fading elegance—scaly outside walls in the Victorian manner, columns and capitals in wood, and high rooms with creaky wooden floors and magnificent jumbles of plumbing overhead in the john, pull toilet and not enough light.

We drove out to the new University Austral campus where 1,500 students learn in a 1-story set of buildings on an island between two branches of the Rio Valdivia. Quiet, beautiful, and friendly.

Hugo Campos (a student of fish ecology, studying *Galaxius maculosus*) greeted us and helped us with innumerable things—a very pleasant and knowledgeable young scientist educated in Germany (many here are). He helped us rent a local drag net boat (45 ft.) for 750 escudos a day including 6 men (including cook and captain). This boat belongs to the local cooperativa which is managed by a Belgian fellow who arrived here as part of a Catholic mission and stayed on to build the cooperativa. It has an excellent galvanized building, a dock, and two refrigerator trucks. Our boat is a bit scruffy but with a good hull and engine and a very accommodating crew.

We took Hugo and his girlfriend to dinner at the Spanish restaurant where we got to vote for a local beauty queen who might ultimately get sent to Spain for the finals—if she can get by Miss Copaiapo, Miss Vina del Mar, etc. I voted hardest for the wrong girl, only because the girl (the wrong girl) was a friend of Hugo's girlfriend.

We ate, among other undistinguished things, *Galaxius maculosus* post-larvae. These 1¼ in. long critters are like sardine larvae—transparent with black eyes. They are steamed in a sauce and are very rich and delicious.

Off to bed after walking back across sleeping Valdivia.

October 4, 1968

Corral, Chile

Up before dawn in a cold, quiet morning. Leanne and I located the cooperativa and found a door open and were able to get all our gear down to the dock by the last light of the setting moon. Soon lights came on in the *Alejandro D* and the crew piled out, all 6 of them. Very shortly we cast off in the river and made our way in the growing light toward Corral Bay at the mouth of the Rio Valdivia. Our craft is a typical dragger, covered with wires and chains and pretty dirty. I set the crew an example to cleaning things up a bit and got my gear ready. Leanne fiddled with her recording gear.

The river runs between tall bluffs and is deep, light green, and with a current of a knot or two. The bay is a beautiful snug one, bounded by 1,000 ft. wooded hills and with some islands. Much is shallow but there are channels sufficient for pretty large ships to reach Valdivia, 13 miles upstream.

We turned northward and encountered a school of *Cephalorhynchus* under the bluff on the north border of the bay. These little dolphins were full of fear and refused to let us get very close. I could see the peculiar rounded dorsal, like that of the adipose fin of a trout, and the dark gray backs.

The school was small, about 6-8 animals, and swam right up against the rocks. Farther up the bay we chased another school with similar results. I was struck with the behavioral similarity of this species to *Sotalia* of the Rio Amazonas, in which these small animals take fright, crowd together, and rush off, breaking spray as they dash the water, plunging along tightly schooled.

The *Alejandro D* cruised around the south limb of Corral Bay and out into the open Pacific. Our path took us close to a shore, which is made up of steep bluffs largely clothed with a gray-green trees heavily pendant with gray moss. Many hillsides are cleared and green with grass and everywhere are nooks and canyons or on knoll tops are little isolated farmhouses or barns, none seemingly connected by roads to Corral over the hill.

The day grew rough with strong SW winds so we went back into Corral Bay and finally before dusk headed for Corral, a village of about 2,000 people, where we would spend the night. Corral is built on a rather steep hillside and consists of tiers of brightly painted frame houses rising up to meadows and groves of Monterey pines (pino insigne) above. The seafront is dominated by the parapet of an old spanish fort built in 1645 as part of the general fortifications of the bay, a pier featuring nice benches of fancy ironwork, and the remains of an iron smelter. Today the town subsists on fishing (all the crew of the *Alejandro D* live there), tourism during the summer when boatloads of tourists come in from Valdivia, and a sawmill. The fort was taken in the early 1800s by Lord Cochran and the steel mill was supplanted by a new mill in Tolcahuano in the late 1950s. It had functioned with charcoal made from local trees but now the Zalcahuano plant uses coal.

We disembarked through a crowd of onlookers on the pier, including Jorge Guzman's (skipper's) family—mother, red-haired frecklefaced wife, round dark-eyed daughter. Jorge is a fine man, humorous, bright, cautious with his boat, and skillfull. He is small but wears his size with extraordinary grace. Leanne and I walked around the hill under an overhanging matting of trailing bamboo that completely covered the broad sidewalk, 10 ft. above the pavement.

The Hosteria gave us a couple of nice rooms overlooking respectively, the lily garden and chicken pen. We walked around the friendly town watching boys play soccer with a tennis ball while a chorus of little girls sat huddled on the bluff above shouting out in high falsetto voices, modern Chilean songs, in a spirit of pure joy for the nice afternoon. We queried the guard at the iron plant and learned of a redwood-like tree that lives in the mountains nearby and must be of very great size. The wood is remarkably like our own redwood.

The fort consisted of a neatly dressed stone wall with inletted cannon slots, some covering the base of the wall. Behind was a deep pit with a tunnel leading to the outside. At one time, the pit was probably a marshalling point for men and arms, then it became a yard for machines for the iron smelter, and now it is abandoned and full of relics of its past—locomotives and old iron scraps.

We walked on, warming up for dinner, and came upon a huge grotto with a vaulted roof, perhaps 80 ft. high and 80 ft. deep in which there was a shrine with candles flickering over the entrance. From the cliff above depended a sheet of vines with light filtering through their lacework. They stopped at about the height of a man's head, and over the roof was a coating of mosses and ferns. It was obviously an old sea cave that had been lifted up, probably during an earthquake.

The earthquakes here (terranotos for land, maremos for sea) in 1960, killed over 100 people in Corral as a wave washed away all of the lower town. A big ship was sunk offshore as the waves stranded it and then returned to break it up.

Dinner and to bed.

October 5, 1968

Up in the dark, and so was the dueno who sleepily suggested a cup of coffee to which we readily assented. Lael, one of the seamen, was there waiting for us, drinking a glass of beer. We walked to the boat, boarded and cast off, leaving the little sleeping town, and cutting out into the dark calm bay.

The Captain took us north along the rugged coast, many times just outside the reach of the breakers. All along the coast were groups of toninas—2's, 3's, or groups of up to 10. Only at a broad open roadstead called Chan Chan did they show signs of running our bow, but even then only fleetingly—enough to get me up in the bow, gun in hand, and safety off.

Just beyond Chan Chan a rocky headland of jagged platy rocks breaks the sea into foaming welling mounds of water that spurt and spray up over the flanks of the stacks. Beyond, out of the reach of the southwest swell was the little village of Mehuin, where the University Marine Station is located. Mehuin is a cluster of houses, mostly up on the slopes, a low river mouth and strand, dominated by a big tourist hotel.

On northward is another cove and another hillside village, Nigue. Here we turned for Corral Bay and had an uneventful trip back. I'm surprised at how close to shore oceanic birds come. The black-browed albatross comes into the mouth of Corral Bay. Most common of the soaring birds is the silver-gray fulmar, an immaculate bird that sometimes skimmed within inches of our prow. Another common bird here is the red-footed cormorant, a beautiful bird, which seems a strange thing to say about a cormorant. Its legs and feet are bright chinese red, its beak yellow, and at the base red. White feathers mark a spot on its neck. Body is speckled gray and white. When these birds take

off from the water they don't run like a shearwater or albatross but flap both feet in unison.

At dusk we entered the bay. Before long Perez on the bridge shouted, "Tonina a la proa!" I rushed up and, by George, there they were, riding the prow. I grabbed the harpoon gun and in the fading light fired at one animal as it rose. This time, for a change, I hit it, and the line raced off the deck. Perez and Erprel, a long, lanky, likeable deckhand, jumped into the skiff, taking the line with them, and while we watched, fought the animal, bringing it close while Erprel wielded a wicked-looking hand lance. Soon the animal was aboard and I could see it was boldly marked with dark gray and white. We towed the skiff into Bahia Amarga where I finally got a look at *Cephalorhynchus* at long last. The animal lay gasping on the deck, so the unpleasant task of dispatching it with the lance lay to me. Hastily out of mercy for the suffering beast I plunged the lance into its heart and lungs and it soon lay dead, thank goodness. What a beautiful creature. It is a very short-tailed species, gray above with the large peculiar, rounded, dorsal, paddle-shaped flippers, no beak but instead a sloping forehead, a white spot behind each pectoral, and a white belly and throat with a broad, dark-gray chevron between the pectoral flippers.

We turned and went up the river and Leanne and I measured it (an old male) between rain squalls, finishing the job on the dock and in the cooperativa warehouse. I took many pictures by the light of the suspended lightbulb held by a little girl who was watching us, along with a couple of dozen other folk. We left the animal in hopes that tomorrow we could get pictures in the daylight and returned to the Hotel where we found Moosemeat all pooped and in need of sleep. Tired, we went to bed. Tomorrow, out to sea again in hope of obtaining materials for Moose.

October 6, 1968

Valdivia, Chile

The lights of Valdivia appeared around the river bend and we docked at the cooperativa. As Leanne jumped off, her camera fell into the water and sank out of sight between the ship and the dock. The Captain rigged lines and hooks and had his crew fling them in, pulling them across the bottom in an attempt to snag the camera case. A wild array of things came up—old rotting hawsers, dead fish, loco guts, wire, old fishing gear—but no camera. I advised Leanne to call a halt, which she did, but still they fished on and finally Lael came up with it on his last toss—dripping and full of water but likely repairable as the water is river water here and not corrosive.

Leanne invited all hands to have a Pisco so off we went. I tried to give the Captain a gift for his help on the boat but he refused it, saying it was an honor to have us on board. He did, however, let me reward his crew.

After the Pisco, off to bed.

October 6, 1968

Valdivia, Chile

With Moosemeat on board and up bandying words with the skipper, Leanne and I tried to measure and photograph the tonina. It is, I suspect, what has been generally called *Cephalorhynchus entropia*, though that name probably lumps animals together.

Rain squalls periodically forced us off the stern, but we finally finished. One of Hugo's students was along, a bright lad who asked quite a few questions to which he already knew the answers. We followed much the same course as yesterday but the wind had changed to the SW and we could expect to head into it on the way back. The surf, too, was much higher and it was difficult for us to go very close to the beach.

At one point, just outside Bahia Corral, we saw a group of llampas near the surf. They fled from us and when under water changed course and came to the surface going in a different direction and very far away from the last point we saw them. They fled until they actually rode in breakers. We could see them riding down the crashing breakers and into white water. Jorge says rough weather drives them off shore where they can be chased more successfully. The animal is reportedly as much as 2x as big as the tonina and has no black band between the pectorals and the gray of the flanks grades gradually into white of the belly. Its behavior makes me suspicious that it is another *Cephalorhynchus* (wariness, tendency to swim in or close to surf all the time)—perhaps it is the large *Cephalorhynchus* in the Museum at Santiago.

The cook, called "El Maestro" by the captain, had a field day since we obviously enjoyed his efforts. First he whipped out locos and mayonnaise with a slice of aji (delicious and tenderized by swinging them against the deck in a sackful of sawdust), next out came a great chupa full of all kinds of champignons, followed by rice and a sauce.

Just when I was holding my tummy in completed satisfaction, out came a steaming potfull of spaghetti and that followed by pina nevada (or pineapple with a sweet white egg sauce). Wow! We staggered from the galley looking for refuge from the next course. Sure enough, he pursued us to our various lairs and offered us coffee or tea or aguitas (hot water and lemon, and often tea).

El Maestro once cooked for 250 people in a copper mine (Condor) high in the Andes and he obviously yearns for a captive audience such as us.

Just a word more about the skipper. He emerges as one of the most human, sharp-witted, honest, and nice people I have met. He is accomodating beyond any need on his part, as well as being very bright. He runs his crew well and with a touch of humor that makes the *Alejandro D* an unusually happy ship.

We turned just beyond Mehuin and began the trip back into a gathering sea. I stood watch in my foul-weather gear as long as it seemed possibly profitable, but before long waves crashed over the bow and it was obvious we could not work further.

We all returned to the afterdeck, galley, or bridge, as the ship plunged along in the cold sea, spray flying against the bridge windows while the captain ran his "automatic windshield wiper" by hand.

Moosemeat was very tired and spent much time below in the bunk and finally emerged, much refreshed. I was glad he could have this break as he has been working very hard at Valparaiso.

No porpoise came to our bow in Corral Bay so we ascended the river in the gathering dusk, bluffs and tree fringes black against the sky and reflected out over the water.

October 7, 1968

Sunday and off for an asado at the University Marine Station at Mehuin. We met Hugo and his nice ayudanta, Lucy, at the University and a long, red-headed fellow named Patricio Steffan, or Patcho, who is a fishing advisor on gear and who provides government loans. All of us loaded gear into his truck and our jeep—wine jugs, bags of vegetables, a whole side of lamb, and were off to Mehuin where Hugo has built a station. Our road took us up through the rolling farmlands that surround Valdivia, through the tree-covered hills, over the extensive shallow lakes caused by the 1960 earthquakes and on to San Jose, where the road cuts to the coast at Mehuin.

This earthquake must have been a terrifying thing—it split roads in a hundred places, lowered thousands of acres of land and tumbled houses and buildings, not to mention the tidal waves in the bay and the catastrophe in Corral.

The fields are green with new grass or wheat or rape. Cows graze and trees and streams are everywhere. Some of the trees are remarkably reminiscent of deciduous oaks, like our valley oak and others are duplicates, in life form, of other California plants. In fact the mimicry of the lush plants of California or southern Oregon is extreme.

We left the paved road at San Jose, proceeding down the lovely river valley to the coast. An uneventful drive through rural Chile—guasos erect on horseback, complete with panchos and spurs, black broad-brimmed hats, ox teams with yokes lashed to their horns, plodding patiently along while their driver directed them with a long withe of willow, which he tapped against this flank or that. These same teams seemed to do most of the plowing too, with tractors very little in evidence.

From the sea Mehuin had a terrible isolated look as if the few families living there had no opportunity for contact with the outside world. Actually the area is well populated with a good road. The village at Mehuin stretches behind the sand bar, with a fisherman's village—"Mississippi" on the south bank of the river and all the boats upstream at the "Caleta Pescadores". Then, there are the summer folk, who come later and double the population.

Hugo has put his station up out of the reach of the waves, which destroyed the last one and his visitor's house is a hard hike up on the knoll above. The lab is nice, clean, with running sea water (through a [?] pipe strung on poles to a beach sump). We trudged up wearily the 80 steps and the trail above to reach the bunkhouse—a nice neat affair with john and kitchen and livingroom and room for about 10 people. It sits on a knoll overlooking a grand sweep of sea coast. Behind is the caretaker's house. He and his family are bright and pleasant. Soon he was preparing the asado. He skewered the side of lamb on a long sword-like piece of iron which he then rested over a special iron wicket. Every few minutes he turned the meat over the bed of coals below. The twist in the iron sword kept the meat from turning on its own. [Drawing]

Before long Lucy came out with jugs of wine, salad, bread and all the sauces. It was a delicious repast with all of us sitting on the lawn looking out over the sea.

After the asado we retired to the bunkhouse and discussed all kinds of problems until everyone got sleepy and went to bed. Especially interesting was the newness of American contact—since J. F. Kenedy. They feel it is important for more of us to come so everyone can see we are not ogres and to increase further contact.

Off to bed.

October 8, 1968

Valdivia, Chile

I rose in the cold morning, dressed, went out for a walk before breakfast. Up in back of the caretaker's house is a trail leading to the canal for water to Mehuin. It goes over a heavily wooded hill and dips down to the aqueduct which runs in a ditch running around the perimeter of the hill. It originates way back up in a heavily wooded cayyon full of gnarled old olivilla trees with an impenetrable underbrush of ferns, fuschias, and recumbent bamboo. One could not hope to walk through it. Birds called everywhere, but I could not see them. Back to the bunkhouse.

Patcho and I took a walk before breakfast and he told me stories about the local plants—he pointed out the “dientes de leon” or dandelion, so our name is probably derived from the spanish one which describes the heavily dentate leaves. He pointed out the foxglove plant, which he said is the best for “papel higienica”.

After breakfast we packed up and said goodbye, which consumes quite a lot of time and energy in Chile, and the three of us set out for Queule, where we hoped to view the *Otaria* colony (southern sea lion) on the rocky point.

The road proved a real 4-wheeler, climbing up sea bluffs and butting through the brush. In the shade it was full of mud holes many of which had been filled with brush. There were grades up which no one could go when it rained. We clanked off into one mud hole in a sickening fashion but were able to emerge unscathed. We finally picked our way down the steep slope to Queule, a town clustered on the slopes above the mouth of the Rio _____. We had picked up a hitchhiker and he led us to a fellow with a boat to rent. The river edge was lined with little piers and boats tied up. Our future skipper was located—a Peter Lorre type with little puffy cheeks, beady eyes, unshaved lips, wearing a silk shirt and suit pants. After a quick financial session, 20 escudos for a trip to the sea lion rookery was agreed on. I inquired, as usual, about the porpoise situation locally. They used them for congrio bait and knew of the three species—tonina, antonina, and llampa. They said one had been taken 4 days before in corbina nets and that it was “over there” by a distant dock. I went over and sure enough, picked up an almost complete skeleton of a *Cephalorhynchus*.

Soon we cruised out over the river bar and along the north shore of the steep mountainous peninsula. Here and there in river valleys were clustered little farms whose fields climbed the verdant slopes. Pines and olivillas topped some hills.

Skittering from the sea surface were dozens of red-footed cormorants and as we neared the tip we began to pass them rising from the water with sea grass in their bills, we supposed to build nests. Hundreds dotted the steep sea cliffs near the peninsula's end.

At the point the large waves produced a mountainous and confused sea of peaking waves. They surged up cliffs as mountainous welling spume-capped swells, peaking and rushing down again. On the southwest corner of the point, on a great fissured stack, rested about 50 southern sea lions, and ten more cavorted in the spume-covered sea. The males are huge old guys with larger heads than is the case with our northern animals.

As we rounded the point Peter Lorre looked at his gas and announced it was “muy baja.” Comforting thought as we tossed in the swells not far from a jagged rocky coast.

Then we spotted a school of toninas (*Cephalorhynchus*) which ran the bow beautifully. Peter Lorre grabbed his harpoon and, silk shirt and all, mounted the prow. He couldn't hit his hat as he missed 3 times, and didn't try on a dozen easy shots. Finally the toninas said “to hell with it” and swam away. We went back, paid off, and began . . .

After lunch in Mehuin (incredibly cheap) off to Valdivia.

October 9, 1968

Valdivia, Chile

Hugo insisted that we see the lake country and arranged along trip for us. Lucy was assigned to us and I felt she might rather have stayed home—not that she complained at all.

After a fair amount of fumbling around, we headed for Villarica with a lake of the same name, one of Chile's famous fishing and vacation resorts about 100 miles to the north. The drive north is through low hills and rich grassy ranch land, dotted with groves of trees and scattered farmhouses and barns. Nearly all plowing is done with ox teams patiently plodding across the fields.

About 2 hour's drive north of Valdivia we turned eastward on a rough washboard road leading to Villarica. Ahead we could see the nearly symmetrical and pure white cove of Villarica poking up.

Here the Andes are low with only occasional volcanic cones such as this one reaching high altitude.

Finally as we ascended low, rolling foothill country, all tended farms and planted forests, before us appeared Lago Villarica. It is large, blue and rimmed with wooded hills and farms—lovely. I was surprised at the low altitude however—it can't be over 2,000 ft. high.

We poked around the chilly [or hilly?] little town of Villarica, threw rocks in the lake, and then drove to the tourist town of Pucon at the east end of the lake. It is lovely—fruit trees in bloom—the great white mountain behind and hills covered with the Chilean robble and a live oak mimic. The parallelism in physiognomy with our own valley oak, live oak woodland is very striking.

We hiked out on a peninsula into the lake—all “oak” woodland and grass, everything green and lush with spring.

Near the end we encountered a rare thing in my experience, a flock of hawks—the tinque or Chimango carrion hawk. There were about 30 birds in one field and occasional aggressive encounters also took place, with an aggressor bird chasing and tumbling after another which did its best to escape.

We also spent some time noosing lizards—the *Liotaenus* here is much like our *Uta stansburiana*—males have brilliant shining blue tails and flanks while the head and back is flecked with a rich yellow. Females are darker and have paravertebral light lines. I caught several. They were exceedingly common on the big robles—as many as 15 being seen on a single tree, though these groups were mostly young females with no more than two males being observed on a single tree.

I snoozed on the drive back, curled up in the rear of the jeep all covered with road dust.

At night I gave a seminar on porpoise acoustics in spanish (with a translation) and it went well.

To bed.

October 9 [?], 1968

Up early and after many goodbyes to our wonderful hosts we rattled off down the road north. The trip was uneventful and pretty much a repetition of our Villarica trip until we decided to cut off at Traiguen and reach Araco, our destination, from the south rather than going north to Concepcion and backtracking to the south. The tradeoff is that the track we took is on graded or dirt roads and the other is paved.

We passed westward through rolling farmland, all verdant, set off by dark lines of windbreak trees. The road dropped down into a moderately deep valley into the tile-roofed community of _____. It is seldom touched by tourists, I think. The signs are absent—hotels, tourist shops, taxis. Instead bullock carts, and the utilitarian things of life.

Passing on, the road rose into hills and then mountains verdant with ferns and trees, streams rushing below. Once we stopped and Moosemeat, for comic relief, I'm sure, fell in the creek. It was ice cold.

On over a steep crest and then we could see Lake ___, tucked between the hills with nary a pier or a boat [?] long shoreline. We understand there's good fishing, but alas, the season doesn't open for 5 days.

Just beyond the lake we hit the coastal plain—all tree farms for the Monterey pine and eucalyptus and farm lands.

At one point we stopped to see an old abandoned mill, complete with water wheel. In the mill pond I watched the big trout rise. There are so many streams and lakes that nothing is fished out, I'm told.

Finally we cut off to Aranco at the southern limb of the Gulf of Aranco, south of Concepcion, and found a nice homey new hotel, the Hotel Huimpalay. Rooms, a tasty dinner, and to bed.

October 10, 1968

Aranco, Chile

Up reasonably early, rousting out the reluctant ones and off to Llico, or so we thought. Llico, it turns out, was destroyed in the 1960 tidal wave and is unreachable anyway, except by boat, so we settled for Tubul. Tubul also is unreachable by car. It is a town of 200-300 people built on a sandspit at a river mouth about 10 km west of Aranco. We jeeped to the opposite bank and caught the government-subsidized ferry over the river (a row boat powered by a brawny smiling fisherman). On the way across we inquired about boats, as we could see the fleet of launches leaving the river mouth. Tito ____ was our man, we learned, and his launch was the only one not occupied in Cholgá fishing. This is the big cold weather industry. These mussels live in the sandy bottom of the Golfo and are collected by divers using either hooka gear or scuba equipment. What a life! The water is near 11-12 deg. C. and they dive all day. There are better ways to earn a living.

Tito lived near the skiff landing and proved to be a barefooted man in middle age, curly gray hair, snaggle-toothed, and speaking perhaps the most impenetrable fisherman's patois we have met yet. We haggled a bit over price, all the while having the irrelevancies of an old gent in a beret thrown in. This fellow simply seemed not to understand about money. At one point he suggested "mil pesos" per day or 12 cents. Then he contradicted Tito who was holding out for 40 escudos a day, by saying it was for two days. We settled on 250 escudos per day, which is a good wage, far over what he

would earn a day fishing. Tito stopped making copper nails from wire and we were off to the mighty lancha *Lupita*, which was anchored in the river behind the village.

It is a double ender about 25 ft. long and powered with a Pontiac auto engine, with the foot peddles still on. Tito had improvised a thrust bearing and a through hull fitting that leaked water at a horrendous rate, requiring bilge pumping about every ten minutes. The carburetor too, was in ill health and so the motor constantly changed speed and sometimes quit altogether.

Soon we were out over the bar and cruising westward toward the defunct town of Illico. Before I could get ready a group of toninas was sighted. No question about it—*Cephalorhynchus entropia*. They sliced quickly past the bow and were gone. We sighted another group and Tito took off in a torrent of rapid-fire incomprehensible fisherman's spanish. No matter how hard we tried we could not slow him down. Speed is part of his language as it is with most fishermen and they simply can't seem to say words individually.

On we went in the calm water of the Gulf of Aranco toward Illico, along the chalk-bluffed coast. The weather was cool, pleasant, and clear.

At the sandy cove of Playa los Frailes we encountered another school of toninas, this time of large size, composed of scattered groups of 4-6 animals. I fired at one that ran ahead of the bow and hit it. For a brief time the others circled some distance away but then left for nearly the entire battle. Leanne could hear no sounds other than snapping shrimp

As Tito tried to gaff the animal it broke away, the harpoon having hit a bone and bounced out, producing only a superficial wound. It disappeared in the murky water.

Try as we did, we could not relocate the school, and as it was nearing lunchtime we returned to Tubul to buy some bread and something to drink. Tito invited us to lunch at his house, which we accepted. It is a low, wooden affair composed of a kitchen, a living room, and probably two bedrooms all going at odd angles to one another as if the house had relaxed over the dune sand beneath. It was immaculately clear. Two of Tito's four daughters (one son) emerged and helped with the meal. They were shy at first but soon proved vivacious and full of laughter. The eldest, Raquel, a slim pretty girl, showed us her needlework and some of the things she had made with shells. The other, Mary Illysia, was shy but emerged after time. She, too, is a pretty girl, and of about 20 years.

Mama, a pleasant graying woman, was the soul of politeness, offering us bread and bringing out a plate of cholgás (mussels) for each of us. In the kitchen pots of unidentified food cooked on the big iron stove, warming the whole house.

I had a cup full of harina, or toasted wheat flour, in cold water. It tasted more like essence of puffed wheat than anything else. After some urging we got Raquel to eat with us but Momma would not, saying bluntly that she could not sit as she had to tend to the food.

In the afternoon the girls accompanied us on a fruitless cruise up the coast. Tito was having troubles with his carburetor and with the stuffing [?] where he had removed the universal joint and installed the main propeller shaft. The fit was poor and much water came in, which Tito or the girls periodically pumped out into the scuppers.

The toninas had scattered, and we saw many individuals and very small groups, most father offshore than before. The wind came up and it was blustery when we went over the bar with inches to spare.

We all landed and made our way across the strand to Tito's house, the dog was still asleep in his basket and Momma still cooking. She said it was a hard life and I believe her. All around are Monterey pine groves but no wood is to be had. It must be bought at 70 centesimos per caja—about 2 ft. square—water comes from the town pump, transportation is bad, and one always wonders if the next earthquake will wipe you out.

Tito talks of the "ricos" when speaking of the Rotary Club which has a ratty looking clubhouse across the stream from Tubul. By our standards the Rotarians here are poverty cases. What must it be like to live in Tito's family. Happiness yes, but niceties of life, no.

We trudged over the mudflat to the waiting skiff, made our way across the river to the jeep. At the same time men were swimming their horses across upstream, leaving them, whereupon the horse turned and swam back, and stood glistening on the sand.

In Arauco there was scarcely time to shop but we wanted to buy some gifts for the girls and Momma and so settled for some quick purchases—scarves for the young ones and a pretty little aji dish for Mother's table. They have so few pretty things that each is a treasure, even including a simple little ash tray that Raquel had fashioned for sea shells.

October 11, 1968

Arauco, Chile

At 8:00 we waited on the bank for Tito to come. When he didn't I dispatched Kenny to the opposite bank and soon the old doddering *Lupita* upped her anchor (or arana, as they call the grappling hook he uses—the anchor line is a long slice cut from a rubber fabric conveyor belt). Tito then explained that the water was't yet low enough to get across the bar—we wondering why he had asked us to appear so early.

Not far out in the calm bay, along the white strand of Playa los Frailes, we encountered what must have been most or all of the toninas along this shore, apparently harrying a school of fish from very near the surf line to ½ a mile offshore.

There were scattered groups of 4's and 5's or maybe a few more—it's always hard to guess how many animals are below the water. Occasional ones sliced into our bow and finally one came alongside right below me. I fired down on it through perhaps 2 ½ ft. of water. The animal instantly stretched in rigor and rolled dead at the surface. It later turned out that I had pierced its heart and perhaps the spinal chord. What a relief!! While I can kill these animals, it is with anguish, especially when they fight and struggle, and to have an instant kill was very relieving to us all. I doubt that the animal could have uttered more than a few seconds worth of sound, if that, and yet two others circled near until the rigid animal was brought aboard. She proved to be a female, as it is so often the case when other animals stand by.

Kenny quickly went to work, obtaining his samples for selectron microscopy of the ear—a process which must be completed in minutes after death if the samples are to be good.

The school evaporated into limbo while we worked on the porpoise—photographing and measuring. It was never found even though we looked diligently. Our track took us west toward the point that marks the western limb of the bay, and there in the shelter of a steep bluffed cove offshore from Illico, we hauled out our food—loaves of french bread, sardines, empanadas, soft drinks, and chocolate, and enjoyed a quiet meal as the vessel rocked quietly at anchor. Illico, as a town, is gone—washed away by a

tidal wave, but in its place is a lush series of field, nice neat barns, a University of Concepcion oceanographic station—all on the flats where the next wave will repeat the damage.

We saw a few porpoises in this area but none would allow us close so we turned and headed back toward Tubul. From time to time Tito rejuvenated his engine. He was so adept at this that we began to be lulled by his efficiency.

All trip sooty shearwaters had streamed by us, coming from deep in the bay and flying toward the point and the sea beyond, on their 6,000-mile circuit of the Pacific. Some red-footed shearwaters (or is it pink-footed) were amongst them. Down in front of Arauco the engine quit more completely than usual, and while Tito fiddled with things too fierce to mention, deep in the guts of the *Lupita*, we watched the shearwaters feed. They had located a school of some sort of surface fish. The forefront of the shearwater flock, thousands of birds strong, glided in on the fish and disappeared as a front of diving birds. 100 yards behind, those who had dove before emerged and took off, running over the water to get weight on, and then themselves became the diving forefront once again. I estimated 10,000 birds were in this milling mob. The fish school moved fast so the site of the diving changed rapidly. It swept toward us and almost before we knew it we were in the midst of the melee. As the fish school moved by the stream of birds rushed past us, all in the swift graceful flight of these glider-like birds, before they dove in a little cloud of spray. As quickly as it came the flock was gone, the noise of wings, of splashing as the birds dove, of swift running webbed feet that took the birds aloft again—all these receded and were gone.

Tito even fixed the engine, but with a nod of agreement between us, tempered by somewhat guarded relief on Tito's, we turned for the river mouth. The tide was pretty low and the old *Lupita* kicked up a cloud of brown bottom mud as she slid over the bar, but in minutes she was at anchor again, in her quiet river retreat. Tito told me it looked calm now, but that when the south wind came howling over the point it funneled down the valley and had capsized a few boats like the *Lupita*.

We went ashore to deliver our gifts. Momma and a neighbor lady were out in the back yard getting ready to bake bread. They had built a fire in the big round mud oven. It had consumed itself and lay as embers across the bricked floor of the oven. The oven was at belt height on a sturdy wooden platform. Momma scraped the coals aside, out the two entrances, and then dusted the floor carefully with a broom made of leafy branches tied together and moistened. When the floor was clean the ladies uncovered two big wooden troughs full of round lumps of dough, each 6-7 inches across and each topped with a dollop of fat to glaze the loaf. Momma put them in carefully, balancing each on an oar and sliding it onto the hot bricks. Then she carefully banked a little hillock of coals near each door, spread a handful of flour over each, which instantly rose in a cloud of smoke. This, she explained, would make the loaves brown. Then doors were propped over each entrance and a wet sack laid over to seal it. As the door closed I could see the loaves rising. We had tasted this bread earlier and it was dense and delicious.

I was anxious to get back to Arauco and so hauled my companions away, while Momma surreptitiously opened Raquel's package in the oven room, looking with obvious pleasure at the pretty scarf. Our goodbyes said, we returned to town.

On trips like these one works closely with companions and little things can magnify. Leanne had gotten thoroughly on my nerves, mostly I think for petulantly

invading the man's domain of decision in which I ran into direct conflict with her. My trip, my decisions—I thought.

So it goes on long field trips. One must work with saints or these things inevitably arise, particularly where challenges to leadership or status are involved. There is almost no situation where the hierarchical feelings of man are more clearly shown. Anyway, I was glad she was leaving tomorrow as I could probably not have held my temper much longer.

October 12, 1968

Arauco, Chile

Phylly and I hope, Susie, are due tomorrow at Concepcion airport to drive back with me. I took Moose and Leanne to the airport and dumped them off, returning down the long trip to Arauco. The afternoon was spent walking the beach between Tubul and Arauco, looking for skulls. I found none. It was pleasant though, the sand covered with machas shells, the gulls, paired Lapwings screeching aloft as I drew near, and the pastoral scene inland of fields, grazing cattle and occasional farm houses.

The long trudge back to the jeep parked on the bluff before Tubul, sack on my back, just about used up what energy I had left—I guess my hike covered about 12 miles, half on the soft sand of the beach. Going back I ruminated that this was daily fare for most people down here—cars belong only to the ricos, what with the 200% impost and low wages. It was easy to dislike them as they swept by, raising a cloud of dust that settled on one and from which there was no escape. No one so much as indicated they might give me a lift. My steady pace took me through the going-home foot traffic of the Tubul soccer game, and then I felt rico again, what with my nylon coat and good hiking shoes.

October 13, 1968

Arauco, Chile

Another day of beach walking. This time going the other direction from Arauco. I made my way through crowds of holidayers—this weekend was Columbus Day and everyone was out for various entertainments. The bombones (firemen) were out again in their shiny regalia, and at one point I had to pick my way through the horse races. About 15 guasos (the local gaucho) came thundering down the road and up the street on which I was driving. “Damned gringos, don’t they have sense enough to get out of the way?”

On the beach I found three skulls of *Phocoena spinipinnis*, a species I had not seen while on board the *Lupita*. Tito had led me to believe that they were here though, and called “pope”. All these porpoises—the tonina, the pope and the llampa, were fished, we learned by a company, headed by a lady, who came down in summer and circled them with a big net. They were used for oil, and Tito said the black pope wasn’t nearly as rich in oil as the tonina. I wonder now, if there isn’t a seasonal migration of the pope into this area in summer, coming in with the thinner blubber coat of a more northerly animal, while the cold-water-loving *Cephalorhynchus* is here the year around, and sports a much thicker layer of blubber.

Toward noon I returned with my prizes and left for the east limb of the bay. There I walked another long beach, this time in the sun. I found nothing but a few beach lizards (*Leiolaemus*), had lunch at a ratty little cafe, and made my way to the airport.

There I waited for 1½ hrs. or so, feeling dirty and out of place with all the spiffy folk who use that facility (built with Alianza para Progreso and USA funding). It was so good to have Phyl and Susie step off the plane. Especially I worried about Susie—she had had trouble with her ears on the flight from LaPaz and was frightened to come with Phyl, but somehow she had come along, and looked triumphant.

We piled into the jeep and went south. I don't like Concepcion much—it's rather soulless, even though set in the midst of forested hills on the banks of the Bio Bio, a river which at this point is nearly half a mile wide and swift.

We returned to our hotel in Arauco, where the Italian dueno cooks delicious meals, and where everything is neat and clean, even if the beds are swaybacked and the plumbing uncertain. I still recommend it—the Hotel Huimpalay.

A nice drive, a nice meal, and to bed.

October 14, 1968

Traiguén, Chile

All of us wanted to visit the Arucanian Indian country to the south of us. These people had actually stood off both Spaniards and Chileans, using the Bio Bio as a barrier, and only in the past 80 years had let them enter. They represent just about the only source of indigenous art and craft, though much diluted for the tourist now, as is the case most everywhere.

We planned to drive southward along the coast, to the Rio Imperial and then drive inland along its banks to Temuco, the Indian capital. Easier said than done, so it proved.

I made a seat for Susie in between the two of us and piled all the luggage in. We have a drum full of porpoise parts and salt, and other collections and field gear plus Phyl's and Susie's luggage. I tied the harpoon gun on the front bumper and we were off. All enjoyed the long drives through tree farms of Monterey pine that dominate this part of the coast. At Canete we shopped for some food and materials for Susie's plant collection, and left munching fresh French bread and slurping pop. To the south our road became gravel and then the resonant characteristics of jeeps sprang into full expression. After a few hours of such jouncing one sometimes gets sensitized and wishes for quiet.

We stopped at the old mill and poked around, finding the arastra and ancient bagging machinery with wooden toothed gears.

It was all farms now, with native brush on the hill tops and ox carts came to dominate as the mode of transportation. Horses were used only for riding and the slow ox cart, with driver maneuvering by means of a long wand, took over. When the driver wants to get out of the way he leaps out and lays his stick lightly against one or the other animal causing him to turn. Then he props the stick against the yoke and both animals stop. I had to be careful as many of the animals seemed unused to car traffic—certainly we saw little but occasional trucks. Our road wound through the hills, past Lake Lheu Lheu, past Indian ranches with a mixture of types—pure Indians, some dressed in garb with the peculiar pendant necklaces and headbands made of pounded coins, full skirts, sashes and scarves, aquiline-featured Chilean men, hard and tough looking, by a life in the saddle, and occasionally pure caucasian types.

We finally reached Dibuco, a small fishing village set on a black sand beach. We asked about the road ahead to Tirua and Rio Imperial. There were two roads it emerged—one to Relun that ran up the hill behind town and another to Tirua that

followed the coast, going across the rickety bridge south of town. We followed that one, having to drive on the strand just about high tide, at one point. It was steep and looked unused by folk like us, though we did encounter a truck or two. Before Tirua we had to ford a stream that ran over the foot of a sand dune. I had visions of quicksand but could see reassuring wagon tracks. In Tirua, another little shoreside village where the inevitable futbol game was going, we asked again and were told the road was bueno to the river. Muy bueno indeed. Right across the river that edges the town we came to a mass of rutted dried mud that looked like the Devil's golf course. We clawed our way over that, and up the ravined hill behind (in the road that is). Shortly we came to a sea of mud with a pig happily playing in it. Inquiring at the farm house alongside, the lady confided in me that ox carts were common enough but she couldn't remember when a car had tried to make it. I think she was probably born in the house too. Prudently, we turned back, to the road at Dibuco that led inland to Relu.

It was touted as the best road and I hate to think what the road beyond the pig must have been like. As we climbed the hills, the open farms gave way to a gloomy and dense forest, probably all but impenetrable to a man on foot. The dried mud patches became wet ones and little cricks came to run down the rutted road. Once in a while we passed a guaso on horseback—his poncho pulled up around his ears, only the eyes showing.

Soldiers too passed on horseback, rifles slung across their saddles. These always polite folk gave us directions and distances, all of which seemed to indicate a long trip ahead. There has been guerrilla activity in the Concepcion area and one can understand why cavalry are needed, and why there are so many soldiers about. It would be tough indeed to track down a redoubt in that jungle.

At one point a fullblown stream gurgled down the road and by dint of picking the hard spots and the high ones, and by use of 4-wheel drive we made it OK. I began to look at both the time—late afternoon, and the gas gauge (less than $\frac{1}{4}$ tank) with some apprehension. If the map was right we should make the next town—Capitain Pastenes—easily enough, and I had a 5-liter can in reserve behind us, but as the miles of winding road stretched on interminably I couldn't help wondering though Phyl and Sus said nothing and neither did I.

Finally we reached Relu, descending down a long, twisting road through pretty leafy forest to this cluster of farm houses. The best we could say was that the road got better. Finally close to dusk we reached Capitain Pastenes, where the map indicated gas. The first person I asked said there was no gas in the whole town. We drove around reluctantly using up a little more of our precious supply and sure enough when we found the pumps—the old type with the glass tops and diagonal meshwork of wire wrapped around, they were dry and locked. We simply couldn't reach the next town 40 km away and this one looked inauspicious for a night's stay—dirt streets, ramshackle housing, street-side sewers in places. It started to rain as I began to query people if there wasn't someone with gas (benzena, they say) in a drum. A couple of people who ran businesses and colectivos were suggested. The first was peopled solely by little people, the father being up the hill someplace. They wouldn't do anything unless their father said yes. The next, the man with the bus, lived in the grandest old house in town—nice garden, diamond-paned glass windows, two stories, came out and said he would check. We walked to his shop and there, blessings be, was a drum with some gas in it. I talked him

out of 15 liters, paid an astronomical price and were off. The problem had been that the gas distributor was trying to force his subdistributor out of business and as a result had cut off the supply for the 100's of square miles surrounding the town.

In the rain, and long after dusk, we reached Traiguén, a town of 8,000 or so. There we located the mighty Hotel Traiguén. It is about 80 years old and we were the only guests. The huge portly bartender signed me up for two rooms. We ascended the shiny, waxy wooden staircase to our funny old high-ceilinged rooms. There was the washstand, the chamberpot, and no heat. The beds were nice and clean and topped by piles of comforters. Down the hall was the bathroom, equipped with a huge old tub with eagle claw feet, and toilets up on daises that made one feel like "The Thinker".

A nice gracious dinner in awful lonely splendor in the nice old panelled dining room and off to bed, where joy of joys, they had placed steaming hot water bottles for us.

October 14, 1968

Chillán, Chile

During breakfast I hauled everyone in to see the kitchen and to converse with the cook, a nice old lady who had lived all her life in Traiguén. The hotel was older than she, she said, and then we admired her stove—a great, green enamel and brass woodburner. She showed us how it heated the water for the entire hotel and how she cooked various things on it.

The trip to Temuco was down paved roads and an uneventful and beautiful drive through bright green farmlands, mostly of the great fundo owners. Temuco proved to have darned few Indians—only a few hawking rugs in front of the main hotels. We bought a reed basket and a rug for Kenny Bloome. The baskets are made like those of the Papago Indians—coiled work wrapped with a pliable strand. The coil is of "junco", probably *Juncus*, and is pale green, the spiral wrapping is like the striped outer cover of bamboo and of a reed called Niocha.

On up the central highway to Chillán. Also a pleasant and essentially uneventful drive, looking at farms, watching the bullock carts change to a four-wheel horse cart, collecting flowers for Susie's pressed collection, and just generally watching the scene pass. Late in the afternoon we reached Chillán, a rather typical farm center town—a pretty Plaza de Armas, all trees and statuary of proud-looking military men all painted silver (why they do this, I don't know, but town after town paints their statuary either silver or worse still, a shiny enamel green). We put up at the nice Hotel Gran, lovely rooms and flowers everywhere, and then visited the earby open-air market, said to be one of the most "pintoresque" in all Chile. It was like an overblown Olivera Street in Los Angeles. Mostly junk but with some nice things hidden in the interstices. We bought little and dickered more.

Dinner and to bed.

October 15, 1968

Renaca, Chile

Up the main highway, collecting flowers and watching the four-wheel carts turn into two-wheel pneumatic jobs, usually made of the front wheels of an old car. At Talca I began to hear a clank everytime the clutch was thrown in. Suspecting we needed grease and oil, I stopped at a service station, and climbing down in the grease pit with the

service man I soon found that the rear universal joint was on the verge of going out. It was slipping from side to side in a ominous manner. As best I could, not knowing any of the terms for car parts, I inquired about what could be done. I suggested that either we could put in a new part, if they were available in Talca, or simply remove the section and drive in front-wheel drive the rest of the way. When we returned from lunch the latter had been done and we scooted off, minus clank, and minus rear drive. It went fine.

Near Rosario we turned off to come into Valparaiso by the coast route through San Antonio. That proved an error, but a scenic one. We went through tree-shaded hamlets and lovely green farms and as we moved northward, through increasingly arid land, mostly covered with the espinosa tree, now all in bright yellow-orange bloom.

Some parts of the road were horribly washboardy and the light front end of the car caused it to dance around a bit, making driving a greater chore than usual. In this drying land we came upon the great white dish of the COMSAT relay station where satellite telecommunications come to Chile, and there we had a flat tire. I changed it in the dusty road, thanking my stars I had had experience with lug bolts with opposite threads and remembering Carl Hubbs who had stayed for two days in the desert not knowing this, or so the story goes.

While I was under the car Phylly noted water leaking out the front, and I asked her to check. “The battery” she announced. I wriggled out and sure enough the battery had broken loose and the case was cracked. I quickly started the engine for fear it wouldn’t work much longer, lashed the battery down with nylon line and we were off, feeling our redundancy disappearing, and wondering if the final end point where the whole mechanism failed like the one hoss say, would come before we reached home, or in the driveway.

At dusk, in the little farm town of Melipilla, I decided to renew a bit of redundancy by buying a new battery. One last stretch of dirt road remained, that to Casablanca. It seemed interminably long and rutty. We jounced and bounced for what seemed hours, while we worried for fear the kids at home would become anxious over us.

At long last pavement. And the car couldn’t take it—it shimmied relentlessly every time I reached 20 mph, and finally, by dint of putting one wheel on the dirt shoulder, being careful of culverts, and the other on the rough pavement we reached the main highway, where, blessing be, it saw fit to run without shimmying. It made peculiar sounds that got louder and louder but we reached home, tired, and glad to see everyone (Dick was already asleep).

Now, how do I get this wreck back to Santiago?

November-December 1968

South America Trip

November 2, 1968

San Juan Bautista, Cumberland Bay, Masa Tierra Island, Juan Fernandez, Chile

At 8:30 AM we were waiting at Rodalillo Airport, between Vina and Valparaiso. Right on time our plane appeared and landed, rolling to a stop amongst a gaggle of horses who wandered on the runway. We then waited for 30 minutes or more for the gas man to show up so we could top off our tanks. He arrived, without keys, lifted off the lid, lock and all, and filled us up. We left Phylly waving us off. We were crowded to the guards. Bill McFarland, Elda Fagetti, Leanne Hinton, and I plus two Peace Corps workers, Glen and Eleanor Meagher, plus the dashing young pilot of our Aero Commander, plus our gear. A nice 2 hour, 45 minute flight—first over the Humboldt Current and over the boundary where cumulus clouds started. We flew low the last 50 miles—looking for whales. Finally the island appeared—a short jagged outline of 20 km length, with plunging cliffs. We cruised the coast—deep valleys, transparent blue coves, plunging cliffs of many colors—grassy slopes, calderas, high fluted valleys clothed with trees of many kinds.

At one point, just by some great vaulted cliffs all laced with lava dikes, we flew over about 10 pilot whales. Their heads looked white though I'm sure this is an illusion of looking from above. They were no more than 150 yards from shore, moving lazily along, very near a fishing boat.

Our plane cut out on the long thin end of the island which winds around as a hogback notched on either side with coves.

The plane sat down on a tiny runway set in a caldera. The end of the runway swooped up to its rim and so did we as the plane halted near the precipitous edge. Taxpa was busy building a road to the town in Cumberland Bay but we had to portage our gear down a long tortuous trail to the beach—the last section being a series of switchbacks down a cliff. Once there we loaded our gear in a 25-ft. double ender that had been pulled through a patch in the cobbly beach with a winch set on shore (hand). We went the opposite way by hauling on the anchor line. Once in deep enough water a Swiss outboard was lowered into a well aft and off we went, cruising along the shore. The cliffs remind one of Hawaii, all fluted and steep and green. They are brilliant in places with reds, ochres, and even blue.

In one cove, we came upon 6-7 fur seals (*Arctocephalus philippi*), sitting on the rocks. We were able to approach within 20 ft. or so before they slipped into the water. A musky odor was very strong. They have a rather pointed snout, a silver mane, and black lower parts. All had been cut with bites around the neck and flippers. One old male slipped into the water and then promptly inverted himself, flippers waving. He maintained this posture—on and off—for 15 minutes until we left. On down the cliff we saw a baby—all black—resting on a rock, but I noted no females. These animals were resting on slabs of rock near lava tubes and caves at the base of an abrupt cliff. On we went, after provoking one to snarl at us by yelling and waving our arms. Bill gleefully photographed the proceedings.

Before long we passed Bahia Ingles where Alejandro Seltete (Robinson Crusoe) had lived. We could see his cave back of the beach—a low-roofed lava tube. Behind was a vaulted valley clothed with trees while lower down green grass painted the steep valley walls. On the ruin we could see chonta trees, a protected species of palm with a beautiful black and white wood, luma trees (*Eugenia*) and others. The luma is native and quite common, a rounded almost reddish tree with a white trunk.

The boat rounded the next point and slid into the little harbor of Cumberland Bay. The little town of San Juan Bautista is where the island's 400 people live. It consists of a jumble of frame houses climbing the slopes, mostly hidden amongst the trees. A small pier extends into the calm clear blue waters.

We were met at the pier by Rinaldo Green who is the big man here—owner of boats, fishing company representative, owner of the hosteria, and a fine, plain, simple, insular person, balding, bright clear eyes, constant sweet expression. His family includes 8 handsome children of which Robinson is one.

Upon the hill is a Spanish fort and all around the plaza are old caverns[?] plus a cross to the German sailors lost in the sinking here of the *Dresden* in the First World War. It lies in 60 ft. of water at the entrance of the bay.

Our hosteria features one communal bath insecurely closed by bolts that enter the plaster. Our rooms are fine, with sway-backed beds. The food is delicious, featuring, of course, the lobster.

Bill and I took a hike to the neighboring caleta where a new hosteria is being built. We walked a precipitous goat trail along the cliffs, through steep, grassy fields, dotted with a yellow-flowered caparidaceous plant. We descended to a little tumbling stream running under fig trees and thence to the cove where we watched the peze sapos clinging to the rocks. This fish, weighting up to $\frac{3}{4}$ lb., is the world's largest clingfish, having a suckerdisc on its throat. They are very alert and flipped off into water when we got too near. We could see them grazing on algae.

Dinner, a bit of pisco, and to bed.

November 3, 1968

Juan Fernandez Island, Chile

We slept well, arose, and made our way to the little pier where Orlando and Juan were readying the lancha. I found that a whaler of the old sailing days had stopped by some 8 or more years ago and in a storm left 2 whaleboats behind. Since then island craftsmen have been building them on the exact plan, of cypress and linque cut in the hills above and sawed with pit saws which we saw in several places near the town. These boats are raked sharply up, bow and stern, nearly double-ended, have a stepping post for a mast and sail. All are copper nailed, many have a cleat for a steering oar, and all ours had the Swiss long-shaft motor going through a well astern.

We cruised out from Cumberland and soon were in blustery water and ever-increasing swells. A big broadbill surfaced near us. I volunteered to try to harpoon him for the islanders but each time we got close he flipped his tail in foam and disappeared. Later, a school of peze luna swam by—*Ranzania*—the oceanic sufish. It was obvious that we could not work farther offshore so I asked Jose to cut around in a circle, ending in an hour or so at Hornitos for lunch. Nothing was seen except the swooping albatrosses (black-browed), cape pigeons, and giant fulmars. We finally entered the lee and slid up

among the cliffs and caves. Mac, Jose, and I went ashore to look in a sea cave for bones, but found instead it was full of fur seals—a dozen young females. They tumbled out, barking and flinging themselves along over the rocks. No bones. Some of the animals crouched in the farthest recess of the cave. We clambered back, boarding the long boat over the algae-slick rocks. Leanne had recorded the melee and had a long tape of underwater barks. On down the coast to a better anchorage we went where Orlando broke out the little wood stove, which he banked with wood while Jose prepared the mess.

We had obtained 2 meros (sea bass—*Epinephelus*) from a couple of fishermen bobbing off the point. Our men replied when given the fish on a gaff, “Que dios te lo pague”—“May God pay you”—a nice touch. It is typical of these people, even the dogs. Everyone has enough to eat, no one frets about money—in fact they seem rather little motivated by it. Witness the presence and even abundance of the broadbill, which draws premium prices on the mainland, and no one has a harpoon or a pulpit. As I said, it extends to dogs who are all kind, well fed, and friendly.

The mess was cooked in the smoke, turned once, and came out brown and absolutely delicious. Some bread and the fish made our lunch. Elda caught cureles (a yellow-tailed jack) with a hand line while we ate.

Another walk on the beach produced some big limpets, and no bones. Tired and windblown we arrived back in Cumberland. Dinner and to bed.

November 4, 1968

Juan Fernandez Island, Chile

The wind was still blowing so I decided we should stay ashore and perhaps take a hike to one of the beaches on the opposite side of the island where we might locate a bone or 2. Actually I was pretty sure we wouldn't make it across the ridges but we all wanted to see the forest in the middle of the islands. Reinaldo suggested we take a guide and obtained a 12 year old boy, Carlos de Rodt, whom he said was a walking map. He was, indeed, as well as being largely mountain goat. Mrs. Green gave us some lunch and we left, back of town. The trail led us up into a steep valley rimmed with nearly vertical lava walls. Except for the vertical cliffs vegetation clothes everything, a fringe of trees showing up along the ridges. After leaving the sloping fields and livestock we entered a low growth of ferns and luma trees and cycads, plus a *Eugenia*. The cycads, called palmitas, form large banks up the steep slopes. (I believe they are a species of fern that looks remarkably cycad like.)

On the horizon we could see the chontas—a slender palm producing a black-and-white-striped wood so beautiful the tree has nearly been extincted but is now protected.

After a steep hike up a switchback trail, through places where the trail was deeply cut into the hill (it is a wood slide of cut trees) we reached the mirador de Alejandro Selkirk, a deep notch in the knife-edge ridge.

We puffed, out of breath, and sat down to enjoy the view. To the east, far below us, lay the little village and Cumberland Bay and to the west lay the long hogback of the island, 3 precipitous fins called Leones, and a long sloping grassy land ending in the cliffs and coves.

We ate lunch, sitting on the rocks in front of an old iron plaque dedicated to Selkirk. It told of his 4 years 4 months on the island from 1704 and of his death at the

age of 47 as a Lieutenant in the Royal Navy. The plaque itself was 100 years old and cast in Valparaiso.

We looked at the steep trail down and I, at least, wondered about the stiff hike we would have to make back up. We started down into a wetter luma forest, passing canelo trees (the bark does not smell like cinnamon). The lumas are gnarled and twisted and their upper branches are wind pruned so that whole slopes are smooth and one can almost see where the wind has pressed hardest by sweeping indentations in the smooth slope. Farther down the wind is less and the trees taller and straighter.

We were accompanied by a pair of dogs—grand, friendly fellows named Blackie and Toby, who enjoyed the hike immensely. They located a strayed cow and succeeded in chasing her ½ mile farther from home. The trail led us down through a deeply cleft trail, sometimes so deep that light dimmed and some ferns seemed almost translucent with lack of chlorophyll, and green moss clothed the moist banks. This trail must be nearly impassable in the rain—a torrent of stones and mud.

We reached a little stream, nearly on the flat. I poked around, rolling stones as is my wont, and discovered both an isopod and an amphipod, both in the moist earth. The amphipods hopped around just like sand fleas when one turns over a pile of kelp. I wonder if they do not represent an invasion from the sea of a form somehow able to convert from salt to fresh water osmoregulation.

We turned and made the hike back up—arriving an hour later at the Mirador, tired, and welcoming the chance to relax for a few moments—especially the dogs who lay down beside us panting furiously. The hike down was hard, especially the lower half, where the slick dirt and small pebbles made slippery going. Every step had to be considered. We collected Elda some ferns and cycads, arriving laden down, full of aches and pains and happy to stop. It had been a steep, rewarding hike, and we were distressed to learn that the new road from the airport will cut right through the mirador, ruining that hard-won spot where we had taken our rest.

Someone had promised Sergio who ran a small fishery that we would visit him, so tired as we were, we all trekked across the weedy city square to his house near the pier. Sergio is a lonely man, deep in the grip of alcoholism. He led us through his house full of toys, mementos of his fled children, 7 of them all gone. We sat at the pine table while Sergio bustled around, coming out with cheese and candies and then setting a wine glass in front of each of us. This he filled with an orange fluid, mucilaginous like the white of an egg. It proved to be made of lobster eggs and livers, lemon juice, and gin. Elda almost couldn't hold herself in check as she sipped. It was the unidentifiable stringy yellow things in it that turned me. Somehow we managed to drink it but Bill, Leanne, and I were only a sip or so ahead of Elda. It was like the pledges at a fraternity initiation drinking horrible concoctions for the old frat.

With Elda carrying the brunt of the conversation we heard of Sergio's desolate life—a wife and children on the mainland, 35 years on the island, illness, loneliness, and especially, little to do. His company was all but moribund now that the fishermen had organized themselves into a cooperative. He was set with some kind of paralysis and hadn't money to go to Santiago and he wouldn't ask his family for any. He deals in lobsters but now has only 2 boats, hardly enough to support him. His lot is idleness, up to 10 liters of wine a day we learned later, uselessness, and a feeling of having wasted his life.

It is hard here in some ways, and remarkably benign in others. Illness is difficult to treat though they have a fine old lady who serves as practicante, and keeps her little dispensary neat and clean. The life is so tranquil that events like our arrival cause great stir and everyone knows what we are doing—yet nearly everyone is simple, direct, a little suspicious of outsiders (though we fitted in quickly enough at our level of acceptance) and everyone is well fed, if not well clothed. The climate is delightful; it's no job to pick big limpets from the rocks, or to catch a meal of peje sapo with our hands, or to trap oysters or catch the mero, or to raise a few vegetables in the fertile soil. There is plenty of good water. "Progress" is coming though, and seems alien, like a cancer. People want it with the lonely half of their hearts, and despise it with the tranquil part of their hearts. We, who know it better, despised it more. The road to the airport—the new hostel will change this place. The timelessness will disappear and those who are taken advantage of will lose their insularity bit by bit and become withdrawn into themselves. In 10 years we could probably not enter life here so easily.

It's tough in paradise though. A man can be somebody, and everyone will know him. If he is strong or wise or clever they will know. If he is weak, mean, or lazy they will know too, and these like Sergio, know too, and sink, destroyed by the idyllic life.

November 5, 1968

Juan Fernandez Island, Chile

At 9:00 AM, after a refreshing sleep, we ate breakfast and headed for the dock, beneath which the school of yellow-tailed jack swam (jureles). Robinson, the young son of Reinaldo, was there waiting for us. He is betwixt and between. Raised on the island and bearing his famous name, yet educated in mainland Chile, holding his bag of swim fins and plate and wetsuit, and not one of the fishermen. He is tolerated by them, not as good or wise about the sea as they, and not one of us either. His compadre was Ernesto, a gnarled fisherman whose whole life has been spent in these seas. We packed the whaleboat and left the harbor under leaded skies, but with very little wind. We headed out to sea off the east end of the island. The motor must have quit 20 times—bad gas, a carburetor that leaked, a spark plug whose wire was held in with a nail, etc. Far off Caleta Francesa we sighted whales—2 or 3 vertical spouts. We closed on them, making our majestic 6 knots, but were able only to see a dorsal fin of a large whale and they were gone, far outstripping us when we came to the same course. No sounds were heard. We came back in with our uncertain motor and landed on the cobble beach at Francesa. Our long walk was marked by learning how to capture peje sapos by hand—they aren't very quick—and by Bill slipping and hitting his head on a rock. He yelled, dazed and bloody, but proved to be OK except for a headache and cut forehead.

We quickly made for the boat and called it a day at the harbor, with Bill resting and visiting the practicante to see if stitches were required—none were.

November 6, 1968

Juan Fernandez Island, Chile

This day Mac and I decided to try to obtain a sea lion. It was blustery as we headed for the dock and we knew we could only work the lee. This meant going around the east end and up the cliffed shore opposite Cumberland Bay. By the time we reached the Caleta Francesa area my stomach told me it was not going to be an easy day.

Between rain squalls and williwaws I hung over the side but was soon thoroughly sick and at the long beach of Caleta Caravahil I had them dump me ashore while Mac went on with the hunt. I scraped a flat place among the beach cobbles and lay down, full of misery. Just to keep me from generating too much joy it rained occasionally. I could look out through some driftwood and see Mac stalking his seal. Soon I heard a shot and then saw the boat playing a carnival[?] on the harpoon line. It came close to the beach, all thrashing and upside down. It was a big male. The shouts suddenly stopped and soon Mac trooped up through the cobbles, looking dejected. The fishermen had tightened their rein over the big bull too much. It had circled a rock, cut the line, and escaped. By this time I was wobbly but better and so got up and attempted to put another iron into the poor animal. We found him out off the point, rolling slowly, harpoon still protruding from his side. We could not approach however as he sounded.

Time was growing short as it takes 3 hours to get back to Cumberland in these outboard driven whaleboats. I asked for one more chance, having them put me ashore on a big rock near the entrance of the fissure cave frequented by the seals. Here the animals swam very close by—within a few yards. Finally when the lines were rigged to my satisfaction I fired again, into another male as he swam no more than 20 ft. away. He raced into the cave, trailing line but in moments the harpoon came out clean. It had hit his back, [?] out, catching only a fold of skin, we believe. At any rate—no sea lion.

There was nothing to do but turn for home with only a few beach bones to show for our effort. It was a miserable trip—all spray and rain. I curled up in the bow watching with a jaded gaze as the rest ate a little food.

This was black Wednesday for sure—back in Cumberland Bay we found that Elda had not been able to get her lobster eggs, and neither had the girls been able to get permission to buy lobsters for our planned party for arriving HERO expedition members, the rain came through on Leanne's bed, and one of Reinaldo's sons fell from a horse and broke his leg in 2 places. Bill's peje sapos died in their bag under the pier, apparently drowned by lack of opportunity to crawl into the air as they do normally on the rocks, there was no way to get warm after our trip (no fireplace in the Green home), and finally, we learned that Nixon had defeated Humphrey for the presidency. Woe, woe. The crowning blow came when we learned that we had been bumped from the plane tomorrow by a load of lobsters. This angered me some in my weakness as I had chartered the whole plane for the trip. It will give us another opportunity to try for the sea lion, and to walk some more beaches.

November 7, 1968

Juan Fernandez Island, Chile

Bright Thursday. Reinaldo lined up Jose and Orlando, the brothers that are amongst the best fishermen on the island, and its only boat builders. They carry on the tradition of making whaleboats. The girls had gotten rather seriously bored on the island when we left them behind yesterday (thank goodness we left them behind, for the sake of my modesty). So, we all made the traverse around the east end in much calmer seas, with the sun shining here and there through the clouds. I was even able to watch and admire the vaulting volcanic scarps rising unbroken a couple of thousand feet from the water—here and there V'd by hanging valleys from which trickled rivulets that fell into the sea.

Halfway up the lee coast we came upon the only whaler with a cabin on the island, under sail. It had 2 jibs out and a mainsail and was cutting along right smart.

We dropped the 2 women off on the long sandy beach at Caravahel while Mac and I went foreward, hoping we could find the wounded animal and deliver the coup de grace. Sure enough, as we approached the cove where I had lain so miserable the day before, there on the rock in front of the fissure cave was the big wounded male. I readied myself in the bow and asked Orlando to creep up as close as we could get. I watched until the animal started to fidgit and began to move toward the water, and then let fly. The harpoon struck, the animal plunged into the pool below and streaked into the fissure, trailing line and a wake of blood. Before he could negotiate the 30 yards, just at the mouth of the cave, he turned in a paroxysm and died, drifting out with the surge. I had mercifully hit him in the heart. He was a huge beast, and it took all our strength to roll him onto the shingle. Mac and I measured him and then began the tedious task of flensing him out. He had a ponderous coat of blubber—perhaps 3-4 inches thick and tightly adhesive to his skin.

Some hours later we finished. I sent Orlando out into the whale boat to start some food going, we loaded our carcass and skin and made for the beach where the girls were waiting. They came aboard waving a skull in obvious triumph. It proved a prize—a waterworn skull of a beaked whale—probably *Mesoplodon* . . . very likely the first record for Chile, though I am not sure of that.

While I watched, chewing on my crust of bread, the others ate delicious broiled lusters, cooked on the same can grill where the mero had been cooked. Reports from the eating public were that it was delicious . . . and I believed them but thought it best to remain moderate. Back at Cumberland we placed a call to Phylly telling her of our delay and new schedule. One hopes these things get through but we could only trust the ejercito, and the intelligibility of what they would say

In the evening we visited a strange poetess—Maria Blanca Luz—in her arty house far up the mounain—surrounded by her 2 young men, sad, blunt to the point of rudeness, loving only the history of the island and not its present. She was worn by years of some kind of dissipation, all this etched on her face. I found her repugnant, her art a travesty, and her hollow and lost like Sergio—even though she only spends 6 months here every year. It is as if she retreats into this bland world as a way of coming to some kind of terms with her own lack of success. We stumbled home through the darkness, down the slippery walk, to the bright happy home of the Greens. I was glad to get there, even if Blanca Luz did have a fireplace in every room. Warmer below than above.

November 8, 1968

Juan Fernandez Island, Chile

Up before dawn as today we are to leave at about 10:00 AM from the airport. The wind was howling and outside the little bay the sea was a mass of whitecaps. With everything stowed we headed out into it—there was no going into the lee this time as we had to land at Padre Bay where the airport trail ended and it was windward today. The whaleboat cut through the sea amazingly well—big swells coming in, blown off at the top, spilling breakers alongside us and the reflected swells from the nearby cliffs confusing the sea into peaks and hummocks that tossed and broke.

All went well enough, though wetly to be sure, until we reached Punta Rinones. We had hit a buoy line earlier and now the shear pin cut and our motor raced impotently. No spare pin was on board. Reinaldo, a calm man, looked around and reckoned on help from 2 other boats that could be seen some distance away. Any substitute for the pin, we wondered? He found a spark plug wrench and if we could somehow cut a piece from the handle it would do. Nothing to cut with. I remembered the cutting pliers in my harpoon gun box. With these Reinaldo soon had a new pin fashioned and we were off as if nothing had happened

Finally, we slipped out of the rough water into the calm Padre Bay, beached the boat, hauled it up with a shore winch and began toting gear up the steep cliff road. The fishermen ran like goats up the steep trail, bearing great burdens, while we shore folk sweated and puffed up the road, stopping every few yards to catch our breath and to let our legs recover a bit. I toted the gun box all the way to the airport, over the objections of the fishermen who came back for a second load. Once there we checked on the plane and found it had started out but had turned back because of some unspecified engine trouble and was now in Santiago. This gave us at least 3 hours, so Mac and I headed back for the beach, to look for bones. We found none but did find some lovely concretions of a hard, heavy white stone, all mammilated and washed by the surf. I provided myself with a burden of them and back up the hill we went.

Then, we waited and called in, waited and called in. The plane was back, it was refueling, it was in the air, it was not in the air, the motor problem had recurred, it hadn't. By this time the wind had picked up and it was growing late, but finally unequivocal word came through that the plane was up and would land at about 6:00 PM. It came in, pretty much on time, and then the pilot informed us that he couldn't take off with this wind. It was too little to fly into and too much to go with. We would have to stay at the airport overnight.

As the passengers that had come in (a lady in nylons and a crepe dress, amongst others) made for the boat and rough trip ahead, we gave them some marizene. Mac and I headed down to Playa Caravahel to get water for the lobsters (we had bought 25) and the peje sapos. It was a long steep climb spidering down the 500-ft. cliff with our 3-gallon jars, and worse coming back. We were recompensed though—I found the jaws of a pygmy sperm whale (*Kogia simus*) and we enjoyed a good stroll on Juan Fernandez' only sand beach. The water crashing on the beach is like glass and one can look into the waves as they hump up and break. Shoals of jureles can be seen rising in the undulation.

A sparse meal of spaghetti, bread, and bacalao (smoked mero) and to bed on the floor. I, for one, slept hard after my 3 hikes up the cliff.

November 9, 1968

Juan Fernandez Island, Chile

At about 8:00 AM we loaded everything on board and took off easily enough, for an uneventful flight back. Phylly was there waiting. Poor gal, she had gone through 3 days of uncertainty at the shore end, waiting for us. Good trip, glad to be back.

November 14, 1968

Letter sent to Phyl from Puerto Montt.

Dearest Phyll and all,

After that wild departure things have been going calmly enough. Kenny lost his jacket on the dock, plus the scotch and candy (woe, woe), though, and we will try to get him another here in Puerto Montt.

Right this moment we are making ready to go through the Canal Chacao that leads between Chiloe Island and Puerto Montt. We have to negotiate it at slack tide as the currents reach as much as 11 knots, and often 9. Since flank speed for this bucket is 10½ we wouldn't get very far.

We'll be in Puerto Montt late this aft. I have given the crew some time there as it is the last port we will hit and even though I begrudge the time the public relations are worth it.

The crew seems excellent to me—all are pleasant and skillful. The skipper is a spare old seaman of a droll turn—very competent and easy to work with. Our own boys seem to be doing well too, though nearly everyone was seasick coming down. I was not and neither was Bob Barrett or Bill Schevill, but Mac and George are just coming out of their problems now. Mac, I suspect, took that long to detank.

We've seen very little so far, but have gotten things in some semblance of order. Tomorrow we will hold harpoon drills and launch drills as well as general shipboard safety drills.

The ship rides nicely, I think—a long easy roll and pitch. She is inconveniently built, I think. One hikes miles of ladders to get anywhere. Our quarters are fine—not *Helix* style, but good enough, though the 4 in the bunkroom have no drawers (we've lent them some of ours).

It won't be long before you start this traverse yourself, I guess. You'll probably find us somewhere near Wellington Island when you fly down. Maybe you can look down on us.

I hope everything goes well up there and that departure is not too hectic for you. Dick's penguin skin is doing fine.

Love to everyone,
Ken

It's all gray fog and drizzle now—maybe what we will mostly get.

November 12, 1968

At sea off Pta. Curaumilla, Chile

After a hectic inauspicious beginning we are finally on our way, beginning our cruise of Tierra del Fuego and the canal country to the north. As our schedule became cut shorter and shorter I finally decided to load everyone in Valparaiso to save time and was unable to notify everyone because they had already begun their trips south. However, everyone finally assembled, Eddie Shallenberger came in from Santiago, Bill Watkins showed up the same day, and Ken Bloome and Bill McFarland, who had arrived earlier spent a hectic day in Santiago obtaining an oscilloscope we badly needed. The convenio had promised it to us but gave next to no help when it was found to be ruined. Another, and better scope was finally borrowed by the grace of one of our friends in the University of Chile.

At any rate, with much gear on the dock, we finally caught a water taxi and climbed aboard. Ken Bloome had had his foul-weather coat and various other personal belongings stolen but nothing useful could be done.

Everyone sagged into his bunk as we headed out into the strong swell.

November 13, 1968

At sea off San Antonio and south, Chile

Fresh breezes today but the HERO rides into them very nicely indeed, with a gentle roll and pitch. Most of my crew is seasick—only Bob Barrett, Bill Schevill, and I escaped. We spent the day trying to organize the gear. Periodically one of the others would pop up, volunteering for work, only to retreat in nausea a few moments later. Even so, we made some progress though the labs are jammed with ship's gear and equipment for future trips. A stowage space is badly needed, but I guess we used that up with our scientific crew of 10.

Not a marine mammal was seen—only sooty shearwaters, phalaropes, albatrosses of 3 species, Cape pigeons, and silver-gray fulmars.

November 14, 1968

At sea off Concepcion, Isla Mocha, and south

More steaming today, and more work getting gear into shape. The whaleboat is an incredible mess. The rudder was too small so a piece was added forward of the post, thus unbalancing it. If the tiller is released it automatically will swing hard over. We are improvising a plywood addition, having removed the other piece. We have laid plans for our anaesthesia work, and will remove the dissecting table to the deck, placing my porpoise box in the lab instead where it can be reached by our instruments. Ken and Bob spent some time in the hot lower lab trying to get the respirator going but have been having considerable trouble. I built a stretcher for handling live porpoises, stitching it out of stout canvas, using pipes we bought in Valpo.

Isla Mocha was passed today. I wanted Anelio to have a good look at it as it is supposed to have a large population of the southern sea lion, *Otaria byronia*. We only saw a single animal in the water but were not able to approach the shore closely enough to see anything else. Our pilot, a thin ascetic Chilean Navy officer named Eduardo Barison Roberts informed us that we would lose a whole day if we spent time inspecting the opposite shore as we would miss the tides in the Canal Chacao, near Puerto Montt, where currents may reach 11 knots at full flood. So we forego a look-see.

Isla Mocha is divided into little farms, like all of the shore along this coast, and is flanked by a long unbroken beach on the lee shore.

Most everyone is still seasick, though they are emerging for longer periods now, and even George Harvey has been eating a bit.

I should list the crew and our scientific party here:

K. S. Norris	Senior Scientist
William Schevill	Asst. Expedition Leader
William Watkins	Acoustics
George Harvey	Acoustics and electronics, support of operative procedures
Bob Barrett	Neurophysiology of trigeminal and sound paths
Ken Bloome	Ultrastructure and anatomy of porpoise organs
William McFarland	Vision of marine mammals, fishes, acclimation studies

Anelio Aguayo	Cooperator on studies of Chilean Cetacea, pinniped populations
Ed Shallenberger	Studies of insularity, general factotum, harpooner
Mickey Barrett	Botany, birds, general factotum

Our Captain is a fine seaman who has spent his life on the water. He is full of stories, good humor, and has really gone out of his way to help us with every request we have made. The same goes for the crew, too. It's interesting to watch them all emerge as personalities and seamen. The mate, a short, wiry seaman named Judson R. Howard, emerges as a steady, skillful helper for us. I am working to keep all our people in his good graces as it is very easy indeed to mishandle his bosun's locker or tools, or simply to demand too much from him. Others in the crew are: Gerald Ouellette (Jerry) the quiet, competent, pipe-smoking engineer; Johannes Bielecki, Assistant Engineer, a German of pleasant disposition; George Trundy, able-bodied seaman, called by all Penny—a bright, hard-working, rising young man on whom everyone relies; Steve Robbins, another AB, a hulking, rather taciturn person of good skill who works very hard (I'm always afraid he is going to lose his pants, he wears them so low); Cardenas Ortego Secundino, a native of Valparaiso, is a seaman, very pleasant and seems skillful. We swap Spanish phrases from time to time; Tom McGuire, the oiler, is a sour-looking fellow who goes about his work silently, but on occasions I have seen him be quick to offer the helping hand—I think he will emerge as time goes along; Hugh Dakers, the cook, is one of the several Maine men on board—a luxury hotel chef during the summer, he can really cook, loves his work, collects menus, and is always on the job, even though he himself may not have slept the night before; Claude Tukey is his shy, young steward, very pleasant and anxious to serve; finally, the electronics-radioman, Malcolm Beaumont, is an old Navy man who comes equipped with a rather rule-book knowledge of his trade—quiet, pleasant, and so far, willing to listen to those who know more—like Watkins and George.

It will be interesting to see how these quick sketches fill in as the trip moves along.

November 15, 1968
Puerto Montt, Chile

As the day wore along the sea became calmer as we entered behind the lee of the northwest cape of Chiloe Island and entered the Canal Chacao. We saw our first marine mammals today, even though I have instituted a continuous watch on the flying bridge the first day. We will continue this whenever the HERO is cruising in daylight hours. Our sightings today consisted first of a school of about 10 *Otaria byronia* plunging along. Bill Schevill, who isn't familiar with sea lions, there being none on the East Coast, thought at first they were porpoises, but I immediately recognized them for sea lions by their plunging leaps, flexible bodies, and lack of dorsal fin. As we entered the Canal a group of porpoises was encountered—plunging swiftly along. I suspect, though cannot prove, they are *Lagenorhynchus*, and that they are also the mysterious llampa which we encountered in Valdivia. They did not run the bow.

Once inside the Canal, which is a mass of boils and tide rips flanked on either side by low bluffs and rolling farm country dotted with graying farm buildings, the water became flat calm.

At dusk, we dropped anchor in Puerto Montt, being unable to find a berth alongside the dock. Here we will pick up some samples from a Universidad Austral professor (Hugo Campos) and obtain some materials for boat repair.

Puerto Montt climbs a gentle hill. It is a fairly large town, undistinguished and much dirtier than Valdivia to the north. I found it graceless and was glad to get back on board ship.

November 16, 1968

Anchored in inlet south of Mechuque Island, Chile

At 11:00, we cast off after having made our purchases. In the calm water and with the time of acclimation behind us, everyone turned to getting everything shipshape. We rigged all our weapons, mounted a line box on the pulpit, prepared weather covers for both guns, fixed nets, worked on the operative gear, had a good orientation meeting in which I laid down various kinds of law about shore parties, safety, cleanliness, protocols when a harpoon is cast, boat operation, duties of everyone, interfacing with crew, and many other items. I'm pleased with my people thus far. Everyone has responded with a will. If only we could get the boat shipshape (the HEROINE), we would be operating full scale, but the radio won't work thus far, the aerial had to be moved and retuned because it was blocking our only available work space, and so forth. The Captain will begin lowering drills tomorrow morning at dawn.

We wanted to leave the perimeter of Puerto Montt in which the porpoises are likely harried for congrio bait, as they are farther north. Hence I picked out a group of satellite islands to Isla Chiloe some 35 miles down the shore, where we could anchor and work the beaches, the small boat, and where the HERO could cruise as well.

About 1800, we entered behind Mechuque Island after a long traverse through the flat water. The water may be flat and devoid of swells but the winds whip it into a whitecap-covered froth all the same, and spotting can be difficult. Anelio, from his position on the flying bridge, once gave the cry "porpoise" but it turned out to be spume on a reef. Only after we had anchored did we see porpoises—2 fairly large animals cruising along within yards of the shore, sharply hooked, tall dorsals—once again, perhaps the llampa. With the launch still inoperative, we simply watched them cruise by. Tomorrow, however, we will use it. The radio gave us the biggest fits today. First, it simply wouldn't work at all, and then the microphone proved to be missing (it was later found, thank goodness) and finally when Beaumont gave up on making it work he called Watt in with a shrug, and said he couldn't fix it, would Watkins help? Watt stood there looking at it, and miraculously it began to play. Now, there's a radio tech for you.

Tomorrow Mac and Mickey will go ashore on nearby Chauques Island and walk the 7-mile beach along its western edge. I will work the HERO with Eddie and Anelio and Bill. Watt and George will try for recordings in the launch after we have a few drills.

It's beautiful here—calm water, inlets, green field-covered islands with wide tidal beaches, clouds scudding overhead from the westerleys that sweep in from the sea.

I've been fighting some low-grade sort of flu and it has now gone (I hope the rest don't get it) and tomorrow we get most of our gear wet.

Mac's up running a dipnet station, and will pickle his goodies in the HERO collection series.

November 16, 1968

Puerto Queilen, Chile

I'm pooped. Up at dawn. It was an interesting day and we almost caught our animals. First thing in the morning I put Bill MacFarland and Mickey Barrett ashore on Isla Buta Chauques to do a bit of beach walking. We could see about 7 miles of unbroken strand for them on this island populated by some 2,000 people. The Captain took them over in the dory and they were soon trudging along, looking for skeletal materials. When Captain Hartshone returned, we began a long tedious effort to get the launch in the water. It is full of bugs. The radio, which Watkin hexed yesterday, quit again today and was quickly brought aboard for further work. Then, the davits had been badly rigged, requiring a lot of additional work. This was finally completed, and then the engine refused to work. Time passed. Finally a loose connection was found. Then, the way of stopping the engine had somehow been removed. In order to stop it one has to remove the hatch covers (inevitably covered with gear), reach in, and twist something. Also the way of stopping the wheel is missing, so we are apprehensive that we may catch our harpoon lines in the screw. Finally, it was launched, being cleverly rigged by the captain, and it chugged off, using my walkie talkies for communication. Bill Schevill was aboard with Watkins and Harvey. They set out to record and then to attempt to capture an animal.

They will rendezvous with Bill and Mickey and we will return on the HERO to pick them all up at 3 PM. Once they left us at 10:50, we quickly set out across the Golfo de Ancud in search of porpoises. The day was absolutely flat calm, clouds piled overhead, and visibility was unlimited. We could pick up penguins for 2 or 3 miles. Our track took us toward the mainland shore, which is here a rugged mass of mountains cut by U-shaped glacial valleys. Anelio and I and Eddie stood spotter watches but could see nary an animal until we turned for the Isla Buta Chauques shore. Then, when we were probably 5 miles from shore, we encountered a pair of small porpoises that ducked furtively out of sight. We circled and circled in the still water but did not find them again—I suspect they were *Phocoena* or *Cephalorhynchus*, but of course, we cannot be sure.

Then, later we encountered a small school (about 5 animals) of what I suspect is called "llampa" in Valdivia. These animals, with a sharp falcate dorsal fin, plunged along splashing the water violently in front of them. Thought I could see at least a small snout, and perhaps a whitish mark on the flanks. They not only ignored us but positively refused to let us come within 150 yards. Knew that porpoises in this mood seldom change and come to the bow, so we called Eddie up from his bow basket, put down the sound-powered phones and made again for our rendezvous. I spent some time today developing a viable harpoon protocol with the bridge. Communication is difficult, especially with a Chilena pilot aboard, and so I moved my position from the bow phones to the bridge wing. All course changes now go through me, and only I request these changes of either the Captain, if he has the helm, or of the pilot. Our pilot is a mid-channel man and rather difficult to convince we want to stop or turn.

Alongside the island we met the HEROINE, with everybody standing up, and the hull glowing international orange. Bill and Mickey had not encountered any marine

mammal bones (they had only walked 7 miles and I calculate roughly 10 miles per skull, so they had 3 to go, I explained). Mickey had his pack full of plant specimens and Mac had picked up a few things like frogs and lizards. I gather that they had a constant retinue of curious islanders following them and asking for cigarettes (neither one smokes). Bill had had a near encounter with the same big porpoise I think is the llampa. He was able to see a white belly, a white flank mark and a very *Lagenorhynchus*-like dorsal. I cannot help but wonder if it is the big animal we could not identify in the Santiago museum. Bill encountered them in less than 3 meters of water in the Canal Tac and within a few meters of shore (30-80 ft.)

Once everyone was on board we made our way south, trying to keep adding a little traverse time to each day's activities. The track took us southwestward toward Chiloe Island and past the Bajo Minna, in the center of the Golfo Ancud. There we encountered 2 small groups of our llampa, feeding on a deep-bodied fish that dappled the sea surface in shoals, around a reef buoy. Bill and Penny and I took the whaleboat out and nothing we did would convince the porpoises to let us close. We never had a shot and finally returned, exasperated, to the ship. Some time later we dropped anchor in the secluded but complete little anchorage of Queilen. On the chart we saw no signs of a town, but there on the shore were a series of brightly painted 2-storey houses, a pier, and the inevitable curious boatmen rowing out to find out who and what we were. When they came aboard we found the town had about 2,000 people in it, the only indication on the chart being a mark for a church.

The trip today was majestic, even though I had little enough time or inclination to admire the scenery. The Andes rise up in some 6,000-ft. peaks from the sea—Corcovado, Coronado, and others, some topped by glaciers and continual snow fields. The Gulf is a mirror, and the sunset over the snowy mountains, turning everything to rose, was lovely.

My day was full of revamping field protocols, getting my crew to finish gear in preparation for live animals, revising various techniques, etc.

We didn't get our animal, but if we can find a stupid one, we'll get them. About this time in every trip of this sort I get maddeningly impatient—a drug on all my friends, whom I hope will put up with me until the porpoise comes.

November 18, 1968
Puerto Tictoc, Chile

Things are looking up. Most of the major bugs in our gear and operations are ironing out, even though we had our moments today. I jumped in the boat with Bill Schevill and Steve Robbins and we took off along the coast of Chiloe Island, north of Tranqui Island. The HERO left to put the shore party [?] and to go off hunting on its own in open water. This arrangement works well—the launch in shallow water where the HERO cannot go, the shore party to comb the beach for skeletal materials, and the HERO for deep water where the launch is not safe.

After an underwater sound check, we left the HERO and proceeded up the channel north of Tranqui Island. We kept near to shore as most of the animals we have sighted thus far have been seen in shallow water. Our course took us in and out of coves, most with a group of clapboard houses, all gray with the weather, a few people on the beach chasing sheep or simply walking slowly along, a dory pulled up above high tide, a

larger boat careened and under repair. The hills above were a patchwork of fields and pastures. Most plowing was done right down the slope of the hills, which gave those of us who worry about contour plowing a twinge or two.

The tidal currents in these restricted waters are extreme. We breasted the incoming current near the inshore end of Tranqui and almost could not make headway against it (6 knots).

The day started in fog and ended clear, bright and lovely. As Bill's vision is not the best I kept a constant watch in the prow, thankful for my foul-weather jacket. Finally, clear across the channel, I saw a dark flash and then focussed my attention until I made sure of a porpoise. It was a pair of llampas, and they were excessively wary. Even though the water was calm, we finally lost them completely after a ½ hour's chase. Never did we come close.

Offshore we could see the HERO putting the shore party on a little islet, and then working with the dory party that was gathering sand. The sand will be used to fill sandbags to prop our experimental porpoises in the operating box in a rigid fashion during anaesthesia and operative procedures. Ken Bloome was one of these and while ashore learned of a whalebone one of the inhabitants had in her garden. He ran up hill after it, returning late to the dory. Mac, whom I had put in charge of the HERO operation, bawled hell out of him for not sending one of the shore party to do the job—with which I concurred wholeheartedly. As I delivered in impassioned fashion in my introductory lecture, one late person holds up the whole operation and time is expensive here.

We worked down the shore to a little estero (Estero Huiladad) and ducked inside it. It was a tranquilly beautiful spot—green hills, little farms, the transparent blue water with flocks of sea birds standing on sand bars along the shore. Most were the brown-headed gull, a graceful species much like the black-headed gull of Europe. Also present were the Magellanic blue-eyed shag, Magellanic penguins in numbers cruising along low in the water, a tern I could not identify, lapwings screaming at us on the beach, and even glossy faced ibises.

As we turned back down the estero to make our way to the 2PM rendezvous, we encountered 4-5 little porpoises swimming in the tide rip at the entrance. They were, with no question, *Cephalorhynchus eutropia*, the same species I had taken earlier as far north as Concepcion. It was Bill's first look and he was glad to see the field characteristics that have already become familiar to me—the peculiar low dorsal fin, very rounded posteriorly, the head bar, the small groups working very close to shore. Try as we did, we could never get close enough to get a shot, even with the shotgun. We tried speeding toward them, going slowly, drifting, but nothing worked. Finally, the HERO, whom we had contacted by radio, steamed in and we went aboard.

Ken's whalebone is probably from a large baleen whale. It will be difficult to identify to species though I will give it a try.

We steamed southeastward, across the Golfo de Corcovado, toward the great snow- and glacier-capped peaks of the Andes that drop right into the sea along this coast. Not an animal was seen in the whole traverse, though watch conditions were good and the watch diligently kept.

As we neared, we could look up on the crest of Montes Yanteles above Bahia Tictoc, and see a plume of vapor issuing from a rent in the snow near the crest of the

mountain, far up in the snow fields. The snow was colored lemon yellow behind the vent, probably from sulfur. The lower mountain slopes are heavily forested. Here and there we could see ribbons of water falling for probably as much as 1,000 ft. The bay itself is spectacular—a deep, curving fjord ending at the base of a mountain with the snowy peaks behind. We dropped anchor at 7, which gave us nearly 2 hours of light, so I requested a shore party to walk the beach on the south limb of the bay. I had Steve put us ashore at mid-beach, and divided my group into 2 parties—Ken Bloome, Bob Barrett, and Mickey Barrett, walking back into the bay, and McFarland and I walking toward the entrance. It was a good productive session. Both groups came up with good skulls of *Otaria byronia*. I talked to the captain and in honor of our first marine mammal material of the trip, we called a happy hour in which 3 bottles of cognac disappeared quickly enough.

Mac and I stirred up some beautiful buff-chested geese with black and white wings. They flew low over us, talking to each other. It sounded like they had engine trouble. The water here is downright chilly—which we found out as we waded out to the launch. The launch, by the way, is functioning pretty well now—the radio works nicely and we were able to keep good contact though the HERO was out of sight. This was a great help in saving time as we could direct the HERO to pick us up after she got the shore party and thus save long traverses.

After dark we returned to the HERO, tired, but after a reasonably good day. The ancillary collections are coming along well—Mac got a chimera, an entirely new class for his vision work. Mickey's plants are piling up at a satisfactory clip, and I think he is getting better and better at making good pressed specimens. Right now I'm busy trying to impress him with the necessity of taking notes as he gathers his plants—size of plant, locale, etc. We've taken several lizards and frogs, which Eddie is working up, and Mac is storing away a few fish specimens as they come along.

One of the interesting birds we saw here was the steamer duck—a flightless species that literally runs and flaps away from you when disturbed, making a long wake on the water. The local folk call them "pato motor"—a fine apt name. Mac picked up a good skeleton of one, which shows some adaptations to flightlessness.

Things are shaking down.

November 19, 1968

Puerto Ballenas, Isla Mulcahey, Chonos Archipelago

The llampa is solved! It is *Lagenorhynchus australis* (Peale), Peale's porpoise. Back to that later. In line with my desire to take part in each part of the operation, I went ashore with Mickey Barrett to walk the beaches on the north limb of Bahia Tictoc. It seemed as difficult as pulling teeth for me to get the ship underway and over near the little cove of Puerto Tictoc. Mickey and I hopped ashore in a little covelet just to the east of the main beach. We soon realized that at the back of the cove was a dark cave, overhung with vegetation and a dripping curtain of water. Upon exploration into the cave, which is wavecut, we found much evidence of human habitation. On the left side as we entered was a midden piled up perhaps 7-8 ft. thick, of shells and fire-burned sand. In the high shelves we could see smoke on the roof and evidence of use as a bed of sorts. It may well be that this cave has been used back into antiquity. We, however, did not have time to find out, but had beaches and cliffs ahead of us.

On the strand we crossed an estuary channel that led in a curving arc back of the beach and almost intersected it again farther west. We walked back on this flat, picking plants as we went. A jungle of various plants overhangs the sand flat. Amongst them were the long red trumpets of the Chilean national flower. A moderate sized tree with compound pinnate leaves was in bloom—large pendant yellow trumpets. We found wild fuschias in abundance and several kinds of ferns. Back deep in the estuary we found a long woven stick fish-trap, and encountered 2 more of the beautiful ashy headed geese. They have always been in pairs thus far. At the deepest part of the estuary we broke through the vegetation for a short way (up to the armpits in ferns, vines, rotting logs, orb spider webs, etc.) and emerged on the main strand.

We trudged on down the sand without so much as seeing a bird bone. The best I could do was to locate the carapaces of several glatheid swimming crabs. It is interesting to me to note them here—this form which is so incredibly numerous off the Baja California coast at times.

We passed the encampment of a group of fishermen. They had a bed of giant saxifrage leaves (the stems of which they chew), a fire, and a sort of wind shelter. Finally we arrived, bushed, at the beginning of the rocks we knew we must traverse to reach the main beach beginning at Isla Falsa. Mickey especially was glad to have a break. It's interesting to me that old types like me can usually outlast youngsters in their teens when one comes to long-term stamina. I think it's that we push ourselves harder and somehow don't feel the exhaustion so soon or so acutely. It comes nonetheless, and finally, hard.

However, I dropped my pack and clambered around in the deep forest along a little cold creek. The water was usually obscured by the density of the vegetation. I collected many shade-loving plants—ferns and lichens especially—during a few minute's break. I heard a 2-noted tinkling call—like the clear clink of dripping water. It came in chorus upstream in the forest, but closer I could hear occasional calls and finally found the culprit—Darwin's frog—*Rhinoderma darwini*—the interesting monotypic family of frogs discovered by Charles Darwin. The male carries the eggs in its double vocal pouches until they have metamorphosed and have even developed their hind legs. I caught 2 and we hoisted our packs and made for the rock barrier.

Once on the rocks, Mickey sighted a school of llampas swimming near shore, so we stopped to watch. There were perhaps 8 animals, and they cruised within 25-30 ft. of the beach, often coming to the surface in unison. I was able to make out an additional 2 animals, swimming isshore of the others—2 *Cephalorhynchus*. It was interesting to see these 2 genera form an essentially mixed school. I tried to run down the beach to photograph them but just then they sped up and swam faster than I could walk so I turned back.

Mickey and I then traversed rocks, now dipping into the surf, now climbing rocks, and now and then being forced into the dense tangled forest to circumnavigate a cliff. It was tough going but we finally emerged through a thicket of bromeliads to a fair-sized beach. I noted a fisherman's skiff working off the rocks at the far end. There we were faced with more cliffs so I hailed the skiff and they came in, put us aboard, and rowed us to Isla Falsa, a ride which we gratefully accepted. Their boat was ancient—made of hand-hewn cedar, with hand-hewn oars. An ancient shotgun rode in the bow—it was held together with wire and looked like a percussion cap modification. They used a gill net to catch what they called "negros". These fish were dried and their catch picked up

once every 10 days by a boat from Castro. They stayed here only in spring and summer as the weather in winter, they said, was horrible, a fact attested to by the high piles of driftwood far up on the beach.

They had almost nothing—tattered clothes, only a loaf of bread and a bottle of peanut butter bummed from the HERO somehow. I promised them a gift in return for their kindness. We shared our lunch with them and then began to walk northward. I was concerned that the HERO would return before we did so I had Mickey stay on this strand, where we planned to rendezvous, and began to walk myself, planning on a 1-hour jaunt northward and back. But I soon made out the outline of the HERO coming in from the west so didn't get very far before having to come back. I poked into 2 driftwood-crammed sea caves with rivulets of fresh water coming from the dense vegetation above. Back at Isla Falsa (a tambolo jutting out into the bay) we climbed to the top of the rocky promontory and made our way down to the shore where we met skipper Stan coming in the dory. The pilot was standing so far offshore that it was a long row back. Once on board we learned 2 things—Bill Schevill and Bill McFarland and Penny in the launch were coming in with a *Lagenorhynchus* which they had harpooned, and the HERO had run briefly aground on an uncharted sand spit in Bahia Tictoc.

As for the ship she was very briefly aground, her foreward numbers indicating that she had been pushed upward 2 ft. or so. I understood it had all been handled calmly and professionally—reversing engines and swinging the helm back and forth to wiggle her. The big screw literally jettied the ship loose. At any rate, I understood a little better why the pilot had us row so far.

I had to pay my fishermen, so I assembled a bag of food, some of my light shotgun shells (they will use the primer, powder, and shot since their gun is .28 gauge), a piece of rather poor manila that I had bought in Valparaiso, and 1 or 2 other things.

This time the pilot dropped us even farther from the beach and Nino and I rolled in. Nino doesn't row very well so we wobbled a bit. In fact it was a helluva row, filled with black thoughts about why NSF hadn't seen fit to put a diesel outboard on board. I figure this jaunt wasted us more than an hour's cruising time. I tied the bag of goodies on the mast at the camp and we rowed back. By this time the HERO had drifted twice as far away in the incoming tide. I decided to row it myself rather than continue the corkscrew and so did it, Portuguese fashion, getting angrier and angrier as I could not raise anyone to get the ship underway. I'm afraid that once I climbed on board I was short with the pilot over the loss of time involved. I hope he gets the message.

Before long we picked up the launch and the porpoise. McF had harpooned it in the copy book spot—6 in. ahead of the dorsal, and the animal, a female, had died in less than 3 minutes. There was no standing by by the other members of the school. All were sure it was the llampa. It was caught within yards of shore when it cut under the bow and Mac alertly nailed it. The party had also discovered 2 southern sea lion rookeries—one on Isla Lipipe, in Bahia Tictoc, where 100-120 animals, including young, were concentrated, and on Farallone los Lobos, to the south, where 11-13 were seen.

Our porpoise is a beautiful animal. Its pattern matches the literature in most regards. It was measured, photographed and its stomach contents taken (octopus and some fish bones). We were all darned tired so will leave the fleshing till tomorrow. As to pattern, there is a double black eye ring extending forward onto the snout, a black cape with a faint saddle of flecked gray, a large lateral grayish white patch flecked with

darker gray, and a darker ventral margin to this patch delimiting it sharply from the white belly. There is a diagonal whitish gray patch extending up from the vent and pinching out below the dorsal. The snout is very inconspicuous.

We cruised in the rain to anchorage some 40 miles to the south in the Chonos Archipelago. In our little comfortless cove we met an ancient sailing boat—open, about 30 ft. long, with 4 men and a dog aboard. They were cod divers. They worked in this frigid water down to 30 meters using hook and rig without wet suits. They wore only wool and had rubber gloves. They slept in the boat completely unprotected from wind or rain. Their lives are surely barest survival.

I tottered off to bed about this time—first taking a delicious shower to wash off assorted layers of scum accumulated during the day. I wondered as I was being washed by the warm water if those fishermen had ever felt such a joy.

November 20, 1968

Puerto Condell, Isla Rivero, Chile

We knew we must make some southing in order to reach the southern waters where we hope for our best collections, so today was spent in travel. We proceeded down the Canal Moraleda, and completed half the traverse across the archipelago to the open Pacific. This will leave us with a rather short trip down the Canal Pulluche, into the Bahía Anna Pink, and into the Pacific west of the Tatao Peninsula.

The day started with high clouds; before it was finished they had settled and we had rain squalls and occasional sleet. The heavily wooded islands are clothed in gray-green—the Antarctic beeches clawing up from the main mass of foliage with twisted trunks. I know from my hikes in similar vegetation how thick it is, almost to the level of impenetrability. The stories of some of the ships that have wrecked near here tell some of the story of this increasingly forbidding land. The HMS WAGER sank near here (south of Golfo de Pena) with 30 survivors (1741) and only 3 survived to reach civilization. Captain Cheat had a canal named after him and various crew members ended up with islands, sounds, and such named after them. At any rate it's no place to make your way easily.

No porpoise has yet run our bow on this trip. Without the launch, we would have seen very little, and without our beach forays, we would have a single skeleton. We hope that reports we hear of schools running the bow farther south prove true. Hence, it is likely that we will make our way south rather more rapidly than we had planned initially. I suspect much of our cruise past Isla Wellington will be involved in resolute southing.

Today we had only a single sighting of a porpoise, in a tidal rip between 2 islands, Watt spotted a single animal and a southern sea lion. The porpoise disappeared like a ghost and was not seen again.

I spent much of the day flensing the porpoise—Kenny made a thorough parasite inspection, and Bob spent quite a long time tracing the course of the trigeminal nerve through the melon. There are external landmarks that will make location of this nerve in the live animal rather simple. The equipment for the operation work is now complete. A trough and operating stretcher have been built, a grounded Faraday cage has been built to cut out 60 cycle hum, and a platform for the micromanipulator has been completed. The dead porpoise was lifted into this set-up to check measurements and positions. So, once we obtain a live animal, this work can go ahead. I should mention that the respirator is

also now functional. A part inside the apneutic plateau control box had come loose and was finally located after 3 days of trying.

We put into Puerto Condell on Isla Riveros at about 6 PM. This little nook is protected from sea winds and fairly snug. I saw time to make a check of the little beach ashore. Before the dinghy reached the *Ulva*-covered beach, we were in a rain squall. Fortunately, we were all decked in foul-weather gear. No bones were found but I did make a pretty good plant collection in about $\frac{3}{4}$ of a hour. The forest is dripping. Branches are covered with foliose lichens, banks of single-leafed ferns feather the upright trunks of trees and matings of low plants come right down to the sea edge.

I was interested to see stands of cycads amidst the forest trees. We hiked to a tumbling cascade and had to turn back. On board, I worked with Mickey Barrett preparing the plants. His collection is now to be measured in feet of thickness and his techniques are getting better under my constant prodding. I think it will be a useful series as we are hitting a variety of nooks not often visited and in the spring when much is in bloom. To be sure, we don't go far from the beach.

At night, several birds came aboard, including, fortuitously, our second diving petrel. Dr. Araya of the Estacion Biologia Marina at Montemar had asked me for any specimens of this group and so they are valuable additions to our collections. My bird man (Mickey) proves to be Audubonish and unhappy about stuffing his feathered friends, so I am breaking in a replacement for this task (Eddie, who couldn't care less).

Tomorrow, Anna Pink and the sea off Tatao.

November 21, 1968

Puerto Barroso, Tres Montes Peninsula, Chile

Up anchor at dawn. George Harvey took the first watch hoping to work in the calm of the canals before mal de mere overtakes him. Poor George is really a chronic case and modest swells take him right out of commission. He has such determination, however, that even in this condition he can be depended on. All his gear waits our command, all charged and ready.

At any rate, down the channel between steep hills islands we went and finally emerged into the Gulf of Anna Pink (named after the "pink" or small craft of the ship ANNA). There we passed several small islands harboring a considerable population of *Otaria*. Anelio, who is taking counts of the population of this species, rushed up and counted what he could—more than 250 animals.

The sky was overcast and the tops of mountains disappeared into the gloom. As we went farther to sea, swells got higher and the wind picked up. By the time we started rounding the Tatao Peninsula it was whipping along at 35 knots, blowing the tops of swells off into lines of flying water. The HERO beat through it nicely, though. My watch donned full foul-weather gear and stood in the storm on the flying bridge. Good thing too, as we began to see porpoises and whales. First I spotted a rank of animals surfing down a big swell off our port bow. At first I thought they were porpoises, and so gave the alarm. But the closer they came the more it was evident that we were seeing pilot whales. They passed 100 yards to starboard as we circled. I could see the big stepped fins of the old adults, and noted their all-dark pattern above and white throat below. There was no diagonal slash of white as usually marks *Globicephala edwardi leucosagmophora*. They were soon lost in the breaking water. Three groups of porpoises

came by but none ran the bow. One group seemed pretty securely *Lagenorhynchus australis*, according to the descriptions of Steve.

Finally at 2100, with dusk descending, we inched our way into the tight little pocket of Puerto Barroso, behind the protection of Tres Montes Peninsula. By this time the rain came in cold sheets, nearly obscuring the gloomy grayish forest slopes of the shore. Everyone felt the malaise of the rough passage, so we did little more than lay plans for the days ahead and to consult with the Captain and pilot. Soon we traversed the Angostura Inglesa, the narrows behind Wellington Island, [drawing] and we must adjust our schedule to conform to the tidal direction.

I stuffed a diving petrel and hit the sack. Poor old Bill Schevill has a sore toe, from an injury of some days ago and spends much time with his foot propped up. He says it's getting better, and I hope so.

November 22, 1968

Puerto Island, Swett Peninsula, Chile

The plan for today was first for me to take a party into the big estero that cuts into the Tres Montes Peninsula and then to cruise in the lee of Tres Montes and Tatao with the HERO looking for animals. If we encounter some, the whaleboat will be lowered and recordings attempted before an attempt is made at harpooning.

My crew, consisting of Eddie, George and myself, with Steve at the helm, descended with the boat and took off into the landlocked waterway. The entrance was toruous and running swift with the outgoing tide.

In the entrance we encountered 2 steamer ducks. When at rest, they ride very low in the water, with just the neck and part of the back showing. We disturbed them and they took off with their combination of running and wing flapping. It is a mode of locomotion that they keep up seemingly far above and beyond the call of duty, until they are sometimes 1,000 yards away and just a white froth mark on the surface. Inside the estero, we cruised near shore, going down one side and returning the other. Steep hills rose into the low-hanging clouds, rain swept us constantly and we saw nothing in the way of porpoises. All during our cruise we were accompanied by giant fulmars, big brownish birds, awkwardly humpbacked but capable of beautiful soaring flight, not unlike that of the albatross for which they are often mistaken.

Our cruise on the HERO fared no better. The pilot would not take us deep enough in the bight to achieve a decent lee, so we ended in a rather strong sea, which required us to turn for shelter as the whaleboat was hung outboard for rapid lowering. No animals were seen.

It was calculated that our passage across the Golfo de Pena would take somewhat over 4 hours and that we would have an additional 2 hours to our planned anchorage on the Swett Peninsula. Hence, I cancelled a planned dogleg out to sea in the Golfo that we had planned as a way of reaching deep water, where we hoped to encounter pilot whales, and other more oceanic animals. Even with the course straight across the Golfo to the Canal Messier, we hit strong swells and considerable wind. As luck would have it, it was here that we saw the day's animals—small groups of *Lagenorhynchus*. In one case they almost ran the bow but shied away some 30-50 ft. away. The HERO plunged into the water, forcing a big spilling wave in front of her, and I suspect this frightens animals away. Only in a calm sea or at slower speeds is she probably optimum for bow riding.

Hence I cut speed on the last encounter of the day, to 2/3 and felt that our chances of drawing animals in were considerably increased, though in this case the animals ignored us, swimming far out to the side and appearing in the wake.

With strong seas running it would have been a feat of some proportions to have harpooned an animal, and an even greater feat to have retrieved him. We face the dismal nexus that where there are animals that we can approach, there is also bad weather and where there are calm seas, we see no animals. All of us hope the reports of bow-riding animals in the Estrecha de Magallanes are true and that we will there encounter catchable animals in calm water.

By the time we reached the Canal Messier the day was almost done. The islands here are very precipitous and drop into channels that are sometimes several times as deep as the water we had traversed in the Golfo de Penas (100-200 meters vs. 1,000 M plus). Our chosen anchorage on the Swett Peninsula is blocked by 2 small islands; the only channel usable by us lies on the western edge and is quite narrow. The ship was obliged to traverse a sill only about 10-14 meters deep. Our fathometer has a noise band that obscures everything shallower than about 10 meters and hence, we were faced with the unlovely situation of having our depth readings disappear into instrument noise at a time when we most needed them. The pilot made one attempt, retreated, and came in again. This time he slipped by the blocking island and into the snug anchorage.

I was terribly physically tired from standing watch on the flying bridge most of the afternoon. The aches and pains don't retreat the way they used to. I'll stay aboard tomorrow while another crew takes the whaleboat out in search of animals.

November 23, 1968

Puerto Grappler, Exmouth Promontory, Chile

We nearly made it today on 2 counts and our first animal had the temerity to run our great foaming bow. But, then, on the other side of the ledger, we didn't make it and the animal that ran the bow got away.

First thing in the morning, Bill Schevill and his boat crew of Watkins, McFarland, and Steve Robbins went out on a hunt in the launch. I sent the dory ashore with Kenny Bloome, Bob and Mickey Barrett to collect plants. There was no beach in the cove but a variety of places where they could land. The chart informed us about the "bosque impenetrable" on the hills above the cove, and that seemed real enough. The fog dropped lower and lower and the drizzle began in earnest. Before long Bill called in that he felt it useless to hunt further in the launch. I tooted 3 blasts on the ship's horn for the shore party to return and both crews came aboard at the same time. The plant collection was small and the going had been a little rough, but they had some material and had collected a steamer duck egg and had watched a mother steamer cruise off with her 5 babies in tow behind.

We began our cruise down channel, keeping watch from the flying bridge as is standard procedure at all times underway. Before much time had passed I spotted a school of some 20 animals leaping in a deep indentation of the channel where we could also see birds diving. Some were leaping from the water and I could guess that they were *Lagenorhynchus* but anything further was impossible. We assembled the crew and lowered the boat, guiding them by radio. The animals began a traverse toward the boat but turned and went the other way. It was some time before we could put the boat crew

on the animals and by then the fog had lowered to water level. The boat was mostly lost to us, appearing out of the fog from time to time, but blessings be, she made a sharp radar target and was always visible to us this way.

Bill announced he was on 5 animals or so, so we waited, dead in the water, for further news. The news came that they had finished recording and would attempt a capture but before long we noted them closing on us and finally they appeared out of the fog and were soon on board. The recordings had been marginal, perhaps because of a fresh-water layer on the salt, and they had never been able to close on the animals.

One of our maneuvers in this exercise had been to run the HERO ahead, spotting the shore, while the HEROINE came up from behind closer ashore where she would encounter the animals. It worked well and would have worked better if the air had been clearer. The radar contact is a great help in all this and I am asking that a roll of aluminum foil be put on board to assist in radar contact should need arise.

Back on board, we began the cruise down toward Angostura Inglesa (English Narrows). The bulk of Wellington Island looms on the west and the precipitous cliffs of the mainland on the east, and they gradually converge, not as 2 cliffs that come together, but as a converging series of islets that dot the channel and make the course tortuous in the extreme. We wanted to fish further, and to make a run up Seno Iceberg, which we thought might be good *Cephalorhynchus* hunting, but the pilot thought otherwise. We wanted time to traverse the narrows, so we slowed nearly to a snail's pace waiting for the current to slow and then began the weaving course through. We have a 4-knot current behind us, meaning we had less control of the ship, but our pilot took us skillfully through, swinging around sharp turns and rocky islets marked with range markers. I could understand his tension, having been through, and wondered how a 350-ft. freighter could negotiate it. One didn't—a freighter had run aground just north of the narrows when a steering engine went out. There she was, 5 months stopped, down at the bows, resting and waiting some long disintegration, between 2 deep channels and flanked fore and aft by rocky shoals.

In the Angostura Inglesa, of course, a group of porpoises raced by, cutting astern of us. They were *Lagenorhynchus* of some kind, probably our associate the llampa. Further in the narrows another group passed us while we resolutely stayed on course. What else could we do? Then, when in the Indian Reach, a long straight channel, we had 2 *Lagenorhynchus* cut in toward the bow, and begin to run us. The pilot, at first, said we could not [drawing] shoot them but finally, after some prodding, relented, and Eddie grabbed up his gun for a shot. The harpoon slipped out of the barrel, its O-ring gone. I replaced it while the animals cut in and out. Finally Eddie fired, and the harpoon slid over the animal's back. My command to the bridge was slow in being answered but the line slipped harmlessly astern. Finally she answered her helm but only in time for us to retrieve the line and harpoon. Eddie, needless to say, was distraught. He wanted very badly to catch a porpoise for us. Once again, he is proving his worth in a field situation—tough, takes orders well, eager, and hard working and bright. He's the kind I'm always happy to have with me when guts or brains are required. Maybe his luck will change. He's now worrying about the effects of refraction on his shot, and next time will shoot low out to the side of the ship, more and more to center as the animal comes under him.

The hills grew into mountains, streams cascaded out of the clouds in long rivulets over the granite cliffs. The trees grew smaller and more and more patches of rock showed through. From time to time through the clouds, we caught a glimpse of a bare rocky peak covered with a patchwork of snow, surrounded by slowly swirling haze. We passed the radio station of these parts, Eden Harbor, where a cluster of wooden shacks lined the rugged shore and a small freighter stood almost anomalously at anchor. Pretty lonely. Bet they don't often hear about VietNam or who is being elected President in Chile, let alone the USA.

After a while we rounded the great granite mountain marked with white cascades and came into Grappler Inlet. The harbor is a snug one, with snowcapped peaks far back from shore, a shell mound on the beach probably from Indians, and a huge glacier-smoothed pinkish granite wall rising to the east, bits of scraggly forest tucked on it here and there, a fine sweep of dense green near the water, and above just tags and tatters.

Plans for tomorrow and to bed. I'm better and so is Bill. Animals running the bow heartened us as did finding schools in the calm canals where they can be recorded.

November 24, 1968

Bahia Corbeta Papudo, Isla Guarello, Chile

At the break of dawn, I roused out the shore party and the 4 of us rowed the dingy ashore to an Indian encampment we could see. It was marked by large piles of Zapatillas (horse mussels) and a large green tree that I take to be an apple. One wonders if this tree grew from an apple core or if it was planted on purpose. At any rate it stands out sharply against the otherwise gray-green forest. The very first thing I came upon was some slabs of whale bone from a large baleen whale. Unfortunately they were unidentifiable any further. We collected quickly as I wanted the HERO to up anchor at 7:00 AM for the day's hunting. The mountains around Grappler Cove are spectacular, glacial-rounded cliffs that tower perhaps 1,500 ft. above the still bay. Back in the U of the canyon forming the cove, one could see a series of mountain crests, increasingly snowcapped, and each with a wreath of vapor or cloud mostly blocking it from our view. The flora is rapidly diminishing in stature as we continue south. Here the forest is no longer a "bosque impenetrable" but instead in many places rocks are exposed and a carpet of mosses and lichens covers large areas. Walking in this carpet is quite an experience. It's a little like walking in a foot-thick sponge saturated with water. Fortunately we were all in full foul-weather gear and pretty impervious to such regional insults.

Cycad-like ferns were everywhere. A crawling juniper bearing tiny little cones was found, as well as a variety of flowering plants. A flaky barked cedar tree was also common—about 15-20 ft. high, and obviously used for wood as several bore axe marks.

Back home in California, I have wondered on occasion where the water marks that stain granite faces like Half Dome came from. Here, it is obvious. With rain an almost constant thing, rivulets flow by the dozens over every exposed rock. In places where a little more watershed exists, these grow to full fledged waterfalls. Thus, around Grappler Cove, there were a dozen sizeable falls in view at once.

Back on board we hove up the anchor and headed out the channel to the south. In distant view up canal arms, we could see the domed white mass of the great "Ventisquero" or glacier that tops the mountains near here and drops icy arms into

various arms of the canyons that become fjords where the sea enters. Mostly, fog and clouds shrouded such views from us. We could see the smoothed granite faces, rising abruptly from the water, disappearing into the gray mist, or catch a fleeting glimpse of a barren mountain peak patched with snow. The canals were often deep—100 fathoms at times.

As we emerged from one of these arms, we met 2 big *Lagenorhynchus*, both of whom raced in to run the bow. It was only then that I realized that this water is not clear but tea-colored, like that of the Rio Negro in Brazil. The animals disappeared a few feet below the surface. I put Eddie down in the pulpit. Finally an animal crossed under and he fired, the harpoon rifling through the water harmlessly inches above the animal's back.

Both disappeared in an instant as we retrieved the spent line. By some effort, I got the pilot to come around in the 100 fathom water for another pass at the animals but they refused to appear again. Too bad, we could use a little "ile in the cask" about this time. It was, however, nice to realize that twice in 2 days we had had animals run our bow.

Then began a long, long tedious day of watching, with wind and rain howling across the flying bridge at times. Our path took us down Canal Wide and the pilot ran us right over the single line of soundings in the middle. Since our animals seem to prefer the edges, I asked to run closer to the canal edge, which precipitated an agreement that any time we left the main track the captain was responsible. This is as it should be, but also, the HERO being a research vessel, should not be expected to conform to shipping lanes. Bill Schevill tried manfully to convince the pilot house crew of the singular navigational advantages of the SIMRAD fish finder which allows sonar vision foreward and down, thus predicting in advance any rocks one might unexpectedly encounter. The pilot quickly switched it back to vertical mode when Bill left. Like all good pilots he is conservative and careful and he had no confidence or understanding of this newfangled gadget. I like him though and respect his professional competence. It is inevitable that his desires should conflict with mine. I want very much for our expedition to succeed and he wants very much for no chances to be taken with the ship. Consequently I will continue to ask and he will continue to demur, and the Captain will adjudicate. The Captain is careful too, but realizes his mission and is willing to navigate into waters away from plotted soundings. For my part, when the captan indicates a bit of temerity I back off at once. All this works pretty well.

The canals became wider and the mountains lower as we pressed south of Isla Wellington and along the shores of Isla Madre Dios. We began to spot seals and I had the ship go in toward a rookery so that Anelio could make his counts. He has logged perhaps 7-9 new rookeries on this trip, a positive contribution of our voyage. Considering that only 5 such rookeries are in the published literature, this is a valuable start.

In the squally weather, we came upon tens of thousands of sooty shearwaters, and they flew up in swooping, swirling flocks as the ship came upon them. I saw some feeding, but most simply flew like swift gliders racing before the wind. They are the "swifts" of the sea, having much the same flight pattern—swooping up into the wind, only to turn with it and to race downward in a long low angle, rising again after nearly dipping wing-tips in the surface.

Not a porpoise was seen though we watched hard, scanning with glasses across the choppy water. My watch is performing well, though the best watchers are

emerging—Mac, Watt, Anelio, George and I, and Eddie. Bill Schevill and Bob Barrett both have bad eyes which cuts their efficiency and Mickey is still unschooled in what to look for.

Our track was to take us out the Canal Oeste to an anchorage near the sea where we would wait for morning before deciding whether or not to go out into the open water for a look at offshore species.

Daylight is long now—it isn't dark until after 9 PM—so we watched and watched. The sun broke through for a time, casting a perfect rainbow ending, believe it or not, at Isla Inocentes. It was about as clear a portent as one could design—we were gloomy and tired with the lack of animals—about 1/10 of the numbers I could expect in Californian or Hawaiian waters—and we need some portents and more, some success in our main mission. The ancillary work goes very well but the porpoises just aren't running the bow.

On down Canal Oeste we went into the teeth of westerly winds sweeping off the sea. The chop was blown into streamers of spray. Just before we were to turn up a side arm to our evening anchorage, Bob and I spotted porpoises simultaneously. A group of *Lagenorhynchus* came alongside the ship. I put Mac down in the pulpit. The damned animals would not run the bow, but played alongside out of reach. Bill Schevill and I noted that there was quite a lot of pattern variation in the animals we could see—ranging from bright white lunate markings on the tail to much dimmer ones. Mac fired—and missed. The harpoon came up with its becket broken completely free of the line. This last batch of harpoons is giving us fits as this is the 4th time we have had this trouble. I inspect every harpoon now to see if the wire becket is at all loose. We've been having trouble with the harpoon lines tangling too, instead of running free from the can. All in all, an uncertain weapon.

Sometimes a school will come back after being shot at so I asked Mac to stay below for a few minutes longer. He had gone down without full foul-weather gear on and was chattering in the cold wind. Sure enough they came in again, and this time Mac did not miss. I could see the stricken animal roll, spilling blood. It did not struggle at all. When we picked it up a few minutes later it was dead from a shot in the lungs. As we went out in the launch to retrieve it much of the school “stood by”, racing along within a few yards of us. They continued this behavior even after the captive was on the HERO. None, however, pushed against the harpoon line or stood between us and the stricken animal. The harpooned animal was an adult female (young adult). Bill Schevill and I studied its pattern, I drew pictures, and finally we concurred that it was like the llama of the north in most respects but that certain pattern differences were evident.

By this time we had reached our anchorage in a limestone mine is in full operation. Many of the peaks around here are scoured limestone—all gleaming white as if covered with a mantle of snow. It was some time before any of us realized that it was rock, not water, making the white. The limestone had responded to ice erosion by formation of some impressive fins of rock, and several rounded plant-free crests. The mine itself operated right at the shore. We could see a little narrow gauge tram, a square tunnel, a pier and some hoists, and a variety of company buildings. Some of the men came on board through the stiff breeze and rain. We gave them coffee and talked. There are 40 men on the beach and the product is shipped to Concepcion where it is used in steel manufacture.

Bill and I decided to wait until morning for flensing, photography and sampling of parasites, etc. So, tired, and with a little more “ile in the cask” we went to sleep.

November 25, 1968

Puerto Bueno, Sarmiento Channel

Up at first light. The shore party cast off in the dory to work ashore while Bill Schevill and I took advantage of an anchored ship to accomplish our cutting up and measuring operation. Accordingly, we laid our animal out, photographed her from all angles, measured her, and then slid her over to the flensing table. This table is one of the nicest innovations on the ship—a wooden table with adjustable sides that make it into a flat-bottomed trough. Thus an animal can be rolled without sliding off the table and the wood keeps one’s knife from becoming dull.

We went through the animal in rapid fashion, fleshing, salting, tying, and tagging. Eddie and I then put her in the barrel and cleaned up the deck. Then Kenny Bloome returned from the shore party and made a parasite examination. The shore party had found it rough going just getting ashore in the dory. In any kind of wind, which we have in great plenitude, she blows like a cork and the thwarts are so close to one another that 2 men rowing either get in one another’s way or lose all power in their strokes. They are tippy, and all in all, no substitute for a good fiberglass hulled work boat. Any kind of outboard would save us endless labor and especially, time. I think the dories are more dangerous than relying upon outboards. It is all too easy to get to lee of the HERO and not to be able to get back. Even a 5-horse Sea Gull would make our work much easier. When Athelstan Spilhaus said of the HERO “she was built as an antique from the keel up” he could well have been speaking of the dories and their goddam hole pins. These relics of the past break (2 sets have gone so far), and because they must be set far apart to allow oar sweep, they put a little hitch in an oarsman’s delivery of pressure and lose much power. I find the only efficient way for me to row with a loaded skiff is Portuguese style, standing up. Curses on the whole rig. If there was ever a conspiracy to keep us all on board the HERO this is surely it.

We stood out of the harbor, sliding down between great limestone promontories. The exposure of these monoliths is so new that water is just begining to make erosional headway. The smooth faces left by the glaciers are rutted with little channels running up the faces of the mountains, in places a foot or two deep. In time, flutings and deep gullies will appear, much faster than with granite which is not so subject to solution

The tree line drops. Most of the mountains are bare a scant 1,000 ft. above the sea line, though much of this may be due to lack of soil. Certainly, however, a true tree line cannot be more than 3,000 ft. high now.

We cut out into Canal Oeste moving toward the sea where we planned to look at the weather to see if a sea traverse to the south was possible or useful. Further, we had had reports that a large sea lion rookery was present on some of the isles near the mouth of Canal Oeste. Bill and I wanted to see if the recording crew could obtain sounds of the school from which our animal came. This would be optimum—a voucher for the producer of sounds, so to speak.

Near where the porpoise had been harpooned, a small group was seen again. The launch was lowered and the listening crew put out their hydrophone gear. Meanwhile the

animals had raced away and could not be heard. More and more we begin to feel that successful listening for these animals will take more animals and likely great patience.

On out the entrance we went into strong westerly winds and increasing swells. The HERO began bucking into the sea sending spray over the bows and against the wheel house windows. Anelio stood outside on the wing and as we passed Conejo Island he began to note “lobos”. On the shoals and on Juan Largo Island a group of about 300 animals was noted—a new rookery area. Only 5 such areas had been recorded previous to this trip. About this time the pilot, who had been growing more and more restive about the sea, turned without a word to us and headed back down the channel from which we had come. Bill and I had already made up our minds that the sea traverse was not a useful maneuver, but neither of us felt the ship was in any danger. At any rate the die is cast and we will go by the inland route to the Straits of Magellan.

The watch produced some porpoises down Canal Oeste and the order was given to put over a listening party. Unfortunately a shackle jammed in the whaleboat and because it was being fixed the pilot did not feel he could turn the vessel for fear of swinging the launch and so our animals left us, and were lost.

Later in the Angostura Guia, I spotted a group of porpoises racing along the ship’s port side and cutting across the stern. They were *Lagenorhynchus* and as best we can tell, the same kind we have been seeing. My call from the bow caused no slowing of the ship or any other indication that my message had been received. When I arrived at the bridge moments later I found that the word was we could not stop in the Angostura but must go ahead. I gave the order to proceed ahead to the nearest turning point and then to return to the position where the porpoises were last seen. This, it turned out, was only a few hundred yards downstream. When we returned, however, the animals were gone. Then, as we returned through the narrows I spotted another school racing along near the bank, heading for the narrows. The HERO was stopped and the whaleboat lowered over the side with the listening crew. They proceeded toward the point where the animals were last seen but we were unable to help guide them from the HERO because the whaleboat radio is out of commission again, this time with a broken wire. The rig on board the whaleboat was such that [drawing] every time the engine needed to be started a hatch had to be lifted that disconnected a watertight connector on the radio cable. It finally gave way and is now being repaired and located elsewhere. The boat failed to locate the animals and returned after something more than half an hour. They did, however, have the chance of working on their routines a bit and becoming more sure of the acoustics of the whaleboat, which are good.

Rather shortly thereafter, just at dusk (2200), we pulled off to the side of Canal Sarmiento into a nice snug anchorage at Puerto Bueno. The skies had cleared during some of this final leg and we could see the rounded outlines of all the mountains, carved down by the slowly moving ice that must have overlain them to some depth.

A happy hour seemed about due so we had a little Pisco in the lower lab, told stories and hit the sack. Tomorrow morning we will try a shore party and a sound mission on the whaleboat simultaneously.

November 26, 1968
Caleta Annelia, Seno Aguila

Before breakfast, I roused the shore party—Mickey and Bob Barrett, Ken Bloome, Bill McFarland, and myself. Donning foul-weather gear (except for Mac wearing tennis shoes which he later regretted rather strongly) we climbed in the dory and were lowered. The wind was howling from the northwest, but rowing across the wind to the south beach, we easily reached our destination. Mac and I were let off and the rest were to go up into the bay to some beaches that showed on the map. They never made it. The wind was so strong on the light, high little cockleshell that ultimately they had to settle for the nearest point of land on the opposite shore, after about 20 minutes of struggle.

Mac and I made our way along the shore. It was high tide and much to our surprise we found that many terrestrial plants could be seen below the sea water—grasses, wild celery, and others. I scooped up a little of the water and tasted it. It proved fresh enough to drink. Probably such a freshwater layer is nearly uniform in the quiet bays and fjords here—there is so much runoff from all the waterfalls and streams.

We made our way up on a boggy point of land, ankle deep in moss and hummocky hillocks of the same. We tried to walk the beach but ran into some rocky promontories, so we headed up the slope to some rocky outcroppings. This path led us through the *Nothofagus* forest. A variety of trees were common too—an *Aralia*, a scaly-barked cedar (*Libocedrus*), a *Mahonia*, and others. As we moved upward, 2 different cushion plants made an appearance—one a soft-leaved white-flowered form, and the other (*Azorella*) with pointed stiff leaves and a yellow flower. *Pernettya*, a shrub with bright-red berries, was also common. I found one of the insect plants (*Pinguicula antarctica*) with yellowish fleshy leaves in a rosette at the base and a single stalk topped by a veined white flower. The sundew plant (*Drosera*) was also common higher on the rocks. Mac noted that the open areas looked rutted as if by animals and about this time I came up with a fresh pile of guanaco dung. On top of the rocky hill, we found a series of little bog pools teeming with tadpoles. Looking down we could see the launch and decided we had better make our way back. On the way down, we met with the wire tail of this area, a beautiful tame little bird with a buff eye stripe, and a reddish tail tipped with long, bare feather shafts, that give the endemic family its name. Other birds called in the gnarled forest as we made our way clumsily through the moss. Mac's feet were darned near frozen when we reached the beach while I was comfortable—even hot—inside my foul weather gear. It would be very difficult to work here without this protection.

The others met us on the beach. Knowing how hard it is for 2 to row these dories, I removed a thwart and rowed all 5 of us, Portuguese style, and to everyone's surprise made reasonable headway against the wind before the launch picked us up and towed us the remaining distance to the HERO. They had not heard animals.

On board we quickly upped anchor and made our way south in the channels. The shore party went below for breakfast while Bill Schevill set the lookout watch.

The weather is alternately squally and overcast and bright with sun. We can often see the snowy tops of nearby mountains now, a thing we all wished for back in glacier country. Perhaps the continual fog and rain keeps the glaciers where they are.

Porpoises like swift water and shallow passages and hence everytime the HERO gets into dangerous water we seem to see our animals. Considering the drought of animal sightings through which we have been going, each one causes us to galvanize into action.

We, the scientific party, know we must take advantage of every opportunity, and the pilot and skipper know that we pick the damndest times for it. This time I spotted some *Lagenorhynchus* running the bow in the midst of the narrows leading into Mayne Channel. I put Mac in the pulpit and within moments he had fired. Bill Schevill on the bridge shouted out his routine “Right full Rudder”, a command designed to swing the stern of the HERO away from the streaming line. The screw will not stop soon enough so the stern must be swung away. The pilot countered with an impassioned “NO”. He will not let the ship off the sounding line, even with sonar on, and especially in these perilous waters, no maneuver, no matter how transient, can be done. I have been cultivating him in order to try to make better interface possible between our 2 objectives and this time he volunteered that we could turn lower down and return. This we did, locating the buoy in the very choppy sea. Mac and the 2 seamen put out in the whaleboat and shortly located the buoy. Mac saw a large animal with the smaller one he had shot. The harpooned animal was still alive so Mac let fly at it with the shotgun. Until the animal was brought on board he did not know if he had hit the adult or the stricken young. Kenny Bloome found the slug in the lung of the little animal, much to everyone’s relief. It is no pleasure to leave an injured animal behind.

Shortly the HERO put into the Seno Aguila, which I had chosen as the anchorage because I thought a cruise by the launch could be made after anchoring, in quiet water where good recording conditions should exist. Also the map showed sandbars where a shore party could work.

The HERO made her careful way into the Seno Aguila and Anelio called out “marsopa” at the entrance—he thought he possibly had seen a different species than the single one we have been working with, but the animals were not seen again. The wind dropped and the walls of rock rose in stature as we entered. The pilot took us to a nook deep in the sound, where the launch was lowered and my shore party began to assemble. Rain came in sheets blown into stinging force by the wind. Still, we know we mustn’t let this sort of weather dissuade us because it, and worse, will be our ration from now on. If it is sunny, put on your foul-weather gear anyway, because it will change in the next 10 minutes.

I worked on the animal while these 2 parties went about their business. I could see the bright-yellow clad men clambering on the rocky shore while not far away in the sound I could see the launch drifting silently. When the launch party came aboard they told of having porpoise swim within 3 feet of the lowered hydrophone but of hearing not a sound. The shore party came back with a modest plant collection. I was able to prepare the animal, salt it, and stow it before they came back. Kenny completed his parasite examination too (very few—a tapeworm and little more than a few stomach ascarids).

The anchorage is beautiful. Toward dusk the clouds faded away leaving bright low-angle sun on the snow and waterfalls of the cliffs, and turning the drab gray-green forest into brightly lighted greens against the pinkish granite of the cliffs.

November 27, 1968

Puerto Angosto, Desolation Island, Chile

Having accomplished both launch work and shore party work we simply gathered up our anchor off the bottom of the bay and made way south. It was reasonably early in the day that we reached Faro Fairway at the entrance to the Estrecho Magellanes (Straits

of Magellan). This little barren rock with its lighthouse and lighthouse keepers dwelling must be one of the world's isolated places to live. The automatic light has replaced most of these tended lighthouses but we received a cheery, almost hungry, welcome in Spanish as our ship slid past. Our all-business "practico" (pilot) answered in militarily clipped phrases, had our position wired to Valparaiso, and on we went, the lighthouseman wanting to talk to us and we slipping farther and farther out of sight.

It's bleak today. The Straits were whipped with strong westerly winds, the tops of swells being whipped off to the east. Once in a while we could catch a glimpse of the snowy mountains of Desolation Island across the Straits, but mostly it was simply a gray pall hung over the landscape. It was early, and I wanted to hunt. To work the Puerto Tamar area we would have to breast the rough water and there was no certainty of a decent lee, so I chose to run up Bahia Beaufort instead. This sound should provide calm water for the recording crew and perhaps they could repeat their effort of the night before and the animals might even be loquacious. At the same time the shore party could be beach walking and making plant collections, while HERO cruised up the arms of the sound in search of animals. A grand, almost heroic plan but not an animal aside from a single big bull *Otaria* was seen. The weather was shifting with the moment as usual, but the boat party had to work in flying spray much of the time and arrived aboard with faces red with the cold, as did the shore people. They reported an island (Isla Leucoton) so covered with mosses and ferns that actual trees were buried in these epiphytes. At one point Ken Bloome dug into the moss and was able to look among dark tree branches to the soil 15 ft. below. They were actually walking on tree tops.

The ship ventured up Icy Sound and from time to time the bluish mass of a great glacier could be seen on the snowy mountain slope above a U-shaped valley from which it had retreated. Under the present circumstances it's hard to understand why a glacier should bother to retreat, but I suppose things were once worse. The terminations of these glaciers are incredible jumbles of ice blocks resting in disarray on slopes often so steep it's hard to understand why they don't fall into the valleys below—perhaps they do.

Deep in the sound we turned the HERO back through waters made milky with glacial rock flour, met our parties on time (the Radio is a big help and mostly is working).

At the junction between the northward passage and the Estrecha de Magallanes we met the day's porpoises—though we didn't know it at the time. A fairly sizeable group of animals (*Lagenorhynchus australis*) came in to the prow and crisscrossed in front of us. The water was so rough I did not want a man on the bow and the pulpit had long since been raised. I should mention that in one maneuver after a single animal a short time before we had turned into a moderate swell and poor ole Bill McFarland who was harpooner, was dunked to his waist. He held on in the 9 deg. C. water, holding the gun high, and came sputtering up the ladder none the worse for wear. Our harpooners wear a harness that is tied to the deck above so there is no serious danger of them washing away, but it is uncomfortable to get dunked in these parts. Even high on the prow spray was coming over with some regularity and I thought it pretty dangerous, so much as we wanted one of those animals, I didn't order a try but watched them play. I also bore a few thoughts of boat launching and recovery to dissuade me from making an attempt.

Our crossing of the Straits was rough, as the swell came at us abeam, along with the wind. We were headed for Puerto Churuca, a famous old hidey hole used by Captain

Reisenberg around the turn of the century as a refuge for a big steamer on which he shipped. We didn't make it. The pilot took one look at the white-capped swells sweeping in the outer entrance and decided to go east or to a port where he would have more control as the ship went into port. He chose Puerto Angosto a few miles farther on. It is indeed "angosto"—or narrow. The HERO slid in between rocky walls only 150 or 200 yards wide and straight as an arrow made for a little rounded bay at the far back. There we could lay out enough scope to hold the ship and still stay safely offshore. Rock walls rose on all sides. Two major waterfalls dropped into the calm circular bay in whose center we rested. All around the slopes were clothed with forest trees—incense cedars, and southern beeches the most important trees, though the winter's bark and the phosphorite were also present. Far above the mountains rose to snowy crests disappearing in the windswept fog.

No porpoises today, and we want to see them badly enough, but it was good to get in from all the weather in such a snug nook, or so we thought. Willi was from the hills swept across our anchorage and finally we began to drag anchor about midnight. The Captain was up quickly and reset it and this time it held, but there is little room for error in this place.

November 28, 1968

Bahia Morris, Isla Capitan Aracena, Chile

Thanksgiving today. For a right proper celebration of this day one should be contemplative and properly contrite about what luck or opportunity has brought. I tried but pretty much failed until along about the second course of our amazing dinner.

My problem was simply that in spite of trying like hell we simply saw no animal today. The day started out with a plant collection at Puerto Angosto. Mac and I went ashore for photography and succeeded in getting [drawings] enmeshed in the mounds of moss and ferns that are piled around the bases of all the trees. We emerged onto some rain-soaked rocks above the trees and made our way back down in time to retrieve the others who were across the bay collecting plants.

I had the joy of rowing across to get them, thus renewing and keeping bright and shiny my low opinion of these dories as work boats for the HERO.

The shore party had left before breakfast and so went below for a bite while the ship hove anchor and made her way into the Straits of Magellan. The wind was howling down the Straits and never abated its entire length. We thought back with wonder to the time when ships made this traverse against the wind, making endless tacks back and forth and spending days or weeks trying to reach the open Pacific beyond the Evangelistas. For our part our pilot took us right down the center line in spite of various entreaties from me that we could expect more animals if we could travel close to one side or the other. We know well enough that the animals can be expected at places where a sound enters the Straits. Bill and I both have been harping on at least a degree of freedom of movement but the HERO is treated as if she were a 300-foot passenger steamer drawing 25 ft. We're safe all right, but our mission of studying the porpoises must wait the chance when we cross a side channel or go out the mouth of a channel into the sea. Otherwise we are largely passengers on a tour.

Except for the Paso Tortuoso, the Straits run as straight as a die northwest-southeast, and take the prevailing wind right down without a lee. In the afternoon we

passed Cape Froward, the southernmost point in the mainland western Hemisphere—below are all islands. It is a prominent bluff with fog and rain on the sea side and sun on the other, resultant from adiabatic cooling and condensation of the air from the west.

Before too long our track took us into the Magdalena Channel and out of the wind. The sea fell flat calm but no animal showed itself. Dawson Island to the east showed snowy summits whose highest points were hidden, all snow-covered with bluish glaciers penetrating below.

Bahia Morris is impressive enough, being set around by snowy peaks, deep and calm with the green forest fringing it. The Chef, Hugh, had worked all day and had prepared an incredible feast—the Captain and I declared wine for the festivities—red and white—and we ate—hors d'oeuvres, shrimp, cold roast beef, meatballs, turkey and dressing, mashed potatoes, green beans, beets, salad, olives and pickles, two kinds of pie, and more that I can't remember. Everyone was stuffed. To bed.

November 29, 1968

Caleta Fanny, Canal Ballevero, Tierra del fuego, Chile

As the shores of Bahia Morris are partly beach I sent 2 parties ashore to collect and the whaleboat out in the bay to listen for porpoises during the shore operations.

Eddie and I took the beach walking duty. The whaleboat dropped us off on a sharp shingle beach overhung with trees. We walked perhaps ½ a mile before being picked up again. The short distance was owing to rocky headlands interspersed with sand and each such traverse took time. I had allotted an hour for this work before getting underway. Many plants were in bloom including a spiky *Ilex*-like plant, an umbellifer and others. We happened on an encampment, perhaps Indian. It consisted of a pole framework lashed together with vines, a little fireplace, and a pot hook of wood. In this dripping forest it's comforting to know that some folks at least, could start and maintain a fire. We watched the ashy headed gese start from the water and fly by. They are remarkably fearless and come within easy shotgun range. Magnificent birds. The kelp goose was common too, the males all white and the females of black-and-white coloration.

The listening party reported almost complete quiet in the bay but no porpoises. They could hear the thrumming of the HERO's auxiliaries a mile away. Not a snapping shrimp was to be heard. An excellent plant collection was made. We noted all this aboard and shoved off down the Magdalena Channel. While the plants were being pressed below we kept watch above. The water was absolutely still but not a porpoise could be seen. The scenery was breathtaking—Mt. Sarmiento stood in the sunlight, temporarily free of clouds—huge and white, with glaciers a flowing jumble on 3 slopes. As these ice rivers [drawing] extend below the main snow fields of the mountain their hundreds of fissures become evident as little rents of blue, all lined up in the direction of ice movement. Typically the terminus of the glacial mass is a no-man's land of jumbled ice blocks piled crazily on one another. The scene was of Sarmiento alone but also peaks in every direction—some triangular monoliths that were once faced on 3 sides by ice and faceted by it.

These deep channels are pretty lifeless. Only occasional birds are seen—surprisingly albatrosses are not at all uncommon, and penguins the most frequently seen bird. Small rafts of 2 to 7-8 magellanic penguins were common enough.

Bill McFarland had set eel traps out, as he has done at several places. This time one came aboard an absolutely solid 5 gallons of hag fish—I don't know how many he had but when sluiced out into a wash tub they filled it half full. I hesitate to guess how many he has taken thus far, but Dr. Hubbs, for whom they are being collected, should be happy.

It amazes me that the only porpoise that has come to our bow in the entire trip is *Lagenorhynchus australis*. Of the other forms reported for Tierra del Fuego we have seen only one—*Cephalorhynchus eutropia* up in the Golfo de Corcovado. It's not the rich area I had been lead to believe.

Our track soon led into the Cockburn Channel with mountains generally becoming lower in profile and the forest trees becoming more and more confined to low fringes and niches in the rocky hills. Birds became more common, with gulls (kelp gulls) making an appearance along with giant fulmars, skuas, and others. Anelio wanted to inspect the rocks out of the mouth of the Cockburn Channel for sea lions so we headed straight out to sea. In the mouth, the welcome cry of "porpoise at the bow" went up from the watch. I put Mac down in the pulpit to try for a live capture with the head net. He tried a couple of times but without several animals at the bow he had little chance. If only one or two animals come to the bow they have freedom of movement but if several come in they crowd each other and their movements become predictable and thus capture is made much easier.

In view of this, I asked Mac to switch to the gun, and it was only moments before he fired, the stricken animal (*Lagenorhynchus australis*) racing off in a trail of blood. I jumped in the whaleboat with Steve and Penny and we set out to retrieve the buoy. The sea was choppy but far from unworkable. I could see that Mac had hit a lung as the animal trailed bubbles. It, however, was pulling strongly so I loaded the shotgun. The rifled ball cartridges we have on board are a fearsome weapon. A proper shot can stop an animal at once. I fired once just as the animal submerged, and was on target but the shot hit the water. The next shot stopped it and we were able to draw the big animal alongside where it died in a few moments. It was too large to bring aboard the whaleboat so we secured it by the tail and had it hoisted on the HERO before the boat was brought up. It was a big female—all our animals thus far have been females.

As Anelio counted seals, Bill and I photographed and measured, Mac took eyes for histology and visual pigments, Moosemeat took an ear for his electron microscopy work, and George collected and preserved the gonads for chromosome counts. Bill and I then fleshed it out as the vessel headed for calmer waters. Anelio had discovered another new rookery for *Otaria* with about 100 animals being sighted. He has added quite a lot to the knowledge of these animals thus far. It is just scratching the surface though, as it seems likely to me that dotted all along the coast are rookeries, the vast majority of which are totally unknown to the biologists. At least he has been able to discover more than were previously known, on this trip.

I wanted to stop at Isla London, just east of the entrance of Cockburn Channel, for shore collecting if we could. The island has never been visited by biologists so our plant collections, especially, should be valuable. The pilot at first recommended anchorage at the east end of the island and then retracted after reading the coast pilot which described the anchorage in less than rosy terms.

Our water temperature is dropping—to 7.5 deg. C, not too far above the 4 deg. C one encounters in the Antarctic. I rather doubt that we will find much further variation here as we don't go much farther south.

Accordingly, we hove to in the channel alongside Isla London and sent a shore party into a little cove a few hundred yards away. The island is a bleak rocky mass, fringed here and there with low tortured trees and covered with moorland cushion plants and moss up to snowline. Once on shore we fanned out, collecting furiously as I had allotted only an hour for the effort. Moosemeat headed for the rocky areas where he could look for crevice plants and I headed for a little copse of trees for understory plants and the hope of finding the incense cedar, which up till now was thought to reach its southern terminus on Chair Island just to the northeast. Bob and Mickey Barrett worked the swampy areas ad down toward the beach. My bit of forest was about 20 ft. high, wind pruned at the top, but still and lush beneath—all ferns and moss, great mounds being piled on tree limbs and on the invisible soil. On my way back I headed for the plant line up on the rocks perhaps 300 ft. above the shore and there found a line of the phosphorito bush in full flower—pretty red pipe-stem like flowers (or match-like, as the name implies) running along the hills. Bob had found them farther along, also in this inhospitable locus.

Moose picked up a sack full of mussels which they cook had been crying for and we boarded the launch and beat our way through choppy seas to the HERO.

The pilot had wanted to go ahead to Londonderry Island but changed his mind and headed instead for Stewart Island and Fanny Cove. I was happier this way as this large island is also uncollected and we will be able to provide another valuable collection tomorrow morning before leaving.

Bill Schevill and I finished our animal, salted and tagged it and stowed it away. The bone pile grows, I only wish the species list would do likewise.

Stewart Island is a big, mountainous, forbidding piece of real estate, and it is a measure of this place that it had not felt the hand of collectors previously. These places are simply unfrequented and here one can truly wander in places where no white man has been. I've often thought I was doing that in some remote place back in the USA and then found a Lucky Strike package at the end of the hike or on top of the mountain, but here it really is the case, I think.

November 30, 1968

Caleta Wulaia, Navarino Island, Chile

In the frosty early morning, with winds whipping, we put our shore party on the beach to collect Stewart. The island is rugged and doubtless will continue to yield flora and fauna for future workers but we had the opportunity of being first. Ken Bloome, Bob and Mickey Barrett headed for shore and came back an hour or so later with a modest collection. I was a bit disappointed as it seemed to me the collectors hadn't understood that every plant is valuable in a situation like this—in flower or not—and that new records or plants they hadn't seen before were not the order of the day. I guess I'm just getting to be an old beezark like, to a modest degree, my old boss Hubbs who always knew he could do a better job than his students. Well, botany is a side issue with us but I do want it to be well done.

Off down the Paso O'Brien we went, past fog and sleet-shrouded Londonderry Island—very bleak wet, and cold, with snowy crests appearing from time to time.

The trees cling in folds of the mountains, being ever more and more restricted. Elsewhere moorland mosses and low clumping plants cover the rock. Finally we entered the Beagle Channel which is a remarkably straight, deep channel between parallel ridges of rugged mountains, glaciers coming down transverse canyons on either side, but especially on the north. As we cruised the wind-whipped channel, glacier after glacier was passed. They poured down into high valleys from shields of ice covering mountaintops back behind and out of our view. One of the largest, Romanche Glacier, is a jumbled mass of ice, literally spilling over from a much bigger mass above that caps the mountains. While we watched, a big cake of ice slid down the cataract of white water running from the melting front of the glacier.

Farther on eastward, Italia glacier was passed—the only one actually reaching the level of the sea in the Beagle Channel. Bill Schevill thinks it is probably the one in which Darwin's party nearly lost their whaleboat to a wave caused by a falling cake of ice.

The pilot mistook my request to anchor in Wulaia, through Murray Narrows, for a request to anchor in Yendegaia, a port just inside Chilean waters off the Beagle Channel. I had no desire to flirt with the Argentine border any longer than necessary and so clarified the situation by asking again for Wulaia. This meant that we quickly approached the portion of the channel in which Chile owns the south half and Argentina the north, cut over to the Chilean side (not far enough to suit me) and made our way into Murray Narrows (4 miles). The terrain changes rather abruptly here, becoming lower in relief and much warmer. We could just see some of the houses of Ushuaia across the channel, and I could look on beyond and see what I assumed was Table Mountain behind Harberton. Right at that moment my family was in Harberton and I could neither guide the boat there nor call them on the radio. They can be reached only on ham frequencies and our ship is not licensed to send on these frequencies. So, it will have to be "so near and yet so far" for another 2 weeks. I hope everyone is braving the rather blustery weather. I can't imagine what it would be like to try to work without my foul-weather gear and the kids and Phyl are not really equipped with that sort of thing. It makes all the difference in the world. One can stay dry, and even hot, while icy rain pelts you and 35-knot winds whip around.

Murray Narrows was an experience. It is really narrow indeed. At the narrowest point the water is thrown into a whirlpool. I could feel the ship fight against being turned and could see the captain adjust and readjust to keep us on an even course.

Not far beyond we entered into Wulaia Bay, a famous old spot where the early missionaries were pestered nearly to distraction by the Yaghans who begged for everything, poked and pulled at the poor souls and yammered in their ears all manner of vile threats. Later it was also the site of the massacre perpetrated by Jemmie Button, one of the Yaghans who returned from England with Darwin.

It is a lovely place. A fine intricate bay, made of rocky headlands and coves, a nice little sheep station, where a man and his family live in an old Navy station. Around their 2-story house are grassy fields, 8 dogs, dozens of wild geese (ashy headed, kelp, and some others).

Bill Schevill and I paid a protocol visit to them and found him very friendly and almost incomprehensible—his Spanish was so fast and so larded with idioms. Further he never seemed inclined to give a direct answer—a thing our Spanish desperately requires. But we learned he tended 2,000 sheep, that he came from Chiloe (Castro) and that he knew about some whalebones down the beach. I, of course, had to look right away and so was off in the direction he pointed, but found only driftwood for my efforts.

We did see a magnificent kingfisher on this walk—very large and blue, red, and white. We also noted that the beech tree is a new species for us and that not only does it bear large tufts of parasitic plants much like our mistletoe, but also on swellings of limbs a large nearly spherical fungus, orange in color and speckled with darker orange. We whacked down a few of these later on for the plant collection. Our friend offered us a lamb and was taken aboard the HERO for a tour and a few gifts. The engineer (asst.) noted he loved matches and generously gave him a cigarette lighter.

Mac and I were dropped off on the beach for some collecting. We had a fine hike down the pocket beach and over the promontories. Everything is much drier here, and spring is much farther advanced. Many more plants are in bloom and some places the soil is actually powdery dry. I collected 2 *Otaria* skulls and an assortment of other skeletal parts. We sat on a rocky point waiting for the launch to pick us up—looking across at the Pasteur Peninsula—a rugged, snow-capped range that set off the quiet bay and its tree-clad slopes and calm water. A lovely place.

Back on board we arranged our specimens and went to bed. Tomorrow, Nassau Bay.

December 1, 1968

Bahia Orange, Hoste Island, Chile

Our first duty this morning concerned the shepherd on the beach. He had promised us a lamb and so we dutifully went ashore in the whaleboat to retrieve it. The man led us to the killing and shearing shed where we found the lamb all dressed. His 8 dogs were joyfully chewing on the entrails outside, and behind a phalanx of wild geese stood watching. I never saw so many geese. The shepherd made it clear that he would guide us in the whaleboat to the whale on the beach. When we began this evolution we went in exactly the opposite direction from my first trek. About 1½ miles north of Wulaia anchorage, we came into a little cove with a pocket beach and there, sure enough, were many parts from a big balaenopterid whale. There was enough of the skull and other pertinent parts to allow a secure identification when I can get to a museum for comparison.

While we were hauling these goodies across the cobbles and into the whaleboat we received word that Bill McFarland and Penny had a porpoise on the deck of the HERO. It later turned out that they had harpooned it just out of Wulaia anchorage and it had rushed into the kelp where it died. They had a terrible task trying to free it. Bill's arms were so tired that he developed a cramp on the row back to the HERO and was tied up for some time. It proved to be another female *Lagenorhynchus*. So, when we hoisted the bones on the HERO, I stayed aboard to tend to the animal while Schevill, Watkins, and Harvey went off to try some recording in the whaleboat.

Later, on the radio (bless the radio, even if intermittent), we learned that they had been in the midst of a school of *Lagenorhynchus*, and that for the first time they had been

able to hear the animal speak. It produced only short click bursts—behavior not unlike our own *L. obliquidens*, which apparently seldom or never whistles. Wat also sighted a pair of *Cephalorhynchus*, getting a good look at the rounded dorsal fins. This is our first sighting of this species since the Gulf of Corcovado. They said nothing that anyone could hear, also like those of the Gulf of Corcovado.

I flensed and measured as the HERO turned out into Nassau Bay. Almost at once we began encountering groups of *Lagenorhynchus*. Mac wanted to obtain an animal for neurophysiological work and so we planned a tail shot that would allow live capture. The head net is a very difficult proposition here—there are never enough animals to crowd them into orderly bow riding schools that can be netted. One needs a predictable path of travel and, especially, surfacing, to net them. So, the shot seemed the most secure method. Mac took one such shot and hit the animal perfectly. It ran off to port, dragging the line under the keel. Something on the skagg entangled the line and tethered the animal. Penny and Bill and I descended into the dory and attempted to free it but failed. We were unable to pick the line on the opposite side in the choppy sea and watched futilely as the struggling animal broke free, leaving us with the buoy and the tag end of the line. The breaks. Most animals do not cut in under the keel.

Word came over the radio that Bill Schevill had harpooned a big porpoise—another female—our 6th in a row. They would wait for us in the vicinity of Wulaia. We met them and hoisted both whaleboat and animal aboard. More flensing.

Out into Nassau Bay, south of Navarin Island we went and quickly encountered more schools of *Lagenorhynchus*. One group quickly cut into the bow and Mac let fly at one animal, hitting it cleanly on the tail stock, right where he wanted it. But, wait, the line came free, sans harpoon. Only the becket came up, pulled loose from the shaft. This fault of the Kongsberg harpoon is giving us serious trouble as about 1/3 of our shots are lost because of it, or of line fouling.

I had Mac reload to see if the animals would run again. This time they came in in some numbers and Mac let fly again and missed. I could see clearly, as could Claude the messman, that the animal previously hit was the one Mac had shot at. The red wound on the tail was clearly seen by both of us. Apparently the harpoon had gone completely through the dorsal musculature and had caused the animal no serious damage.

Then, I had Mac reload again. The animals came in again and he fired—a pretty shot right where he wanted it. The animal dove down and under the ship and the buoy came up bobbing on the water, only a little tag end of line attached. We all decided to quit at that point as our lines and harpoons were getting in some disarray and Mac was a bit dismayed at the losses, as was I. I hate to leave wounded animals behind.

I gave the order to make for Orange Bay on Hoste Island.

As we travelled along we could see the Wollaston Islands in the distance, and finally Hermite Island, just north of Isla Hornos. We are about as far south as we can go. The islands are rather low by comparison with much of the country we have passed, and the moorland covers most areas. Trees are restricted to draws and their tops are wind-pruned into the exact cotours of the terrain as if trimmed with barber's shears. Packsaddle Island was approached—a perfect “montura” of stone. Finally, we slipepd into Orange Bay, the site of observations of a total eclipse by a French astronomical team back in the late 1800's. Many of the local place names are French as a result of their work here. Terrain is low—a few snowy crests, but mostly exposed rock promontories

with rolling grassy lower terrain, here and there splotted with copses of trees—Antarctic beech, winter's bark, and the holly-like shrub (which actually belongs to the Loganaceae). The area is used for sheep grazing—an austere station indeed for the shepherds. Wind and sleet and rain are the usual lot here, though the sun does come through from time to time—low on the horizon and seemingly unable to warm one very much.

The Lieutenant wanted to pay his respects to the “Naval Base” on shore—a cluster of sheep shearing sheds, a pier made of gnarled tree trunks, and a little house over whose ridgepole waved a tattered Chilean flag and from whose chimney stack scudded a trail of smoke. We tried to land, but failed. The tide was too low and so the 2 Navy enlisted men who came down to meet us stood with their little dog waiting for company but being unable for the moment to carry on a conversation. We returned to the HERO, picked up the dory, and came back. By this time the mast sported a clean new Chilean flag, obviously in response to their spotting a Chilean Naval officer in our midst, and not to the execrable Spanish I yelled at them across the water. The Lieutenant smiled a brief knowing smile at this sign of recognition and went ashore.

I put my botanists on shore at a nearby cove, and was myself put ashore across the bay where I hoped to look for bones. Bill Schevill, whose toe still gives him some trouble, stayed aboard to finish flensing and tagging the second animal. My walk took me around the peninsula near the “Naval Base”, as the sign said over the sheepshearing door. They had some badly camouflaged guns hidden in the trees. These were sheltered in A-frames covered with galvanized iron painted in shades of green, and covered with cut branches of the *Nothofagus* tree. Unfortunately for their camouflage the branches had dried and stood out sharply from the remaining gray-green forest. I think they were old anti-aircraft guns of some small caliber. Likely this is why we are not allowed on the south coast of Hoste Island, and I'm surprised we could come here to view these preparations against the Argentinians.

The old sheherd at Wulaia was in Naval employ too—he had a key with which he could report any Argentinians that wandered that far up the bay. I suspect such lookouts are scattered all over these southern islands. Austere lonely duty it is too, but something to keep the Naval spirits up.

My own walk produced no bony mementos and I even failed to reach a decent beach. The entire shore was cobbly, studded with rocky promontories. The flora is sparse, composed of things we have seen before, but much reduced in species. Many plants again grow beneath tidal line in response to the great freshwater run-off. At times the rain came in stinging sheets which cascaded harmlessly off my foul-weather gear. My watertight integrity was held the day before (“All water is one inch over your boot tops”) and my feet were cold.

It was good to get picked up and brought back on board the nice warm HERO. Maine fishermen don't know how to row in kelp. They have only the shorter “weed” there and thus the technique of dipping oar blades only half under water is unknown. Hence they had a pretty tough time getting the dory in to me.

The long days, when light goes to 10-12 PM and starts at 4-6 AM tend to make us overwork. I tend to want to use every available moment of light, our time being so short. Hence it always seems difficult to get these notes down. I'm writing these on a morning sortie out into Bahia Nassau, expcting any moment for a “porpoise alert” to come down

from the bridge. My station is on the headphones on the bridge. We send Mac down on the pulpit (our best shot), Edie is on headphones in the prow watching him. If he fires, Eddie yells “fire” into the phones, calls out “right full rudder” on the bridge. This is given for a few seconds and at the same time the power stopped. The stern swings away from the line (if all goes well and the animal does not dive under the keel). Then we pursue the beast in the whaleboat, if it is not off somewhere listening, or the dory if that’s all we have. Dory duty in a choppy sea is something else, I assure you. [Drawing]

Tomorrow we head out for the Wollastons and hope to spend the night there. Weather looks good. Nassau Bay looks like good hunting territory too, wide open but with a very considerable protection from the circumglobal westerly swells of the Antarctic seas.

December 2, 1968

Puerto Maxwell, Hermite Island, Chile

Mighty close to the Horn, we are at the end of this day. Some could see that impressive rock through channels in between Herschel Islands and others to the east.

It all started out with a recording session in which the whaleboat took off in Orange Bay as soon as breakfast was completed, while the HERO cruised offshore in search of animals. About 2 hours later we met them outside Orange Bay. They had heard nothing and we had seen nothing. The best they could do was report a group of steamer ducks taking off very close at hand, all at once. When I saw “taking off” I, of course, refer to them “steaming off” across the surface. They beat their 2 wings simultaneously in a sort of rapid rowing movement and apparently beat their legs alternately since one can see them yaw from side to side as they move along.

I wanted to cruise around the Wollastons, using them for a lee, in order to traverse some of the open ocean in workable water. Thus we headed east from Orange Bay, north of Grevy Island. There we inspected the rocks at the northeast corner for southern sea lions, made a cut into the indentation of the island on its northeast end and thence out to sea toward Isla Evout. This island is a steep-cliffed one, not very large, but standing rather high out of the water. The sea became too rough to work when we were perhaps 10 miles east of the Wollastons. Back we came, setting a course for Barnevelt Island, and that too proved too rough, so we came closer in still. Rough and very cold—sleet occasionally swept across the decks. At the eastern terminus of Canal Franklin, off Isla Frecinet, we encountered scattered small schools of *Lagenorhynchus australis*. Bill McFarland, by now our gunner, went down in the pulpit and readied himself for a shot. It was to be a shot in the tail to obtain a live animal for our neurophysiologists. The whipping wind and swell made it very difficult for Mac, plus the typical crisscrossing swimming of the animals, which presents targets for instants only. It wasn’t long, however, before Eddie Shallenberger shouted “fire” into the sound-powered phones and the bridge responded by an instantaneous “right full rudder”. The float was thrown over and the ship’s stern swung away as planned. I looked at the float and for a time thought no animal was on it, but soon it began to move. The whaleboat was swung over the side with the head grabber and Eddie on shotgun in case the animal had to be killed.

There ensued a long and difficult fight. Moose handled the line much of the time and returned exhausted. Finally, the animal was brought in close aboard and one of the crew men grabbed her by the tail and she was soon snaked aboard, right in Mac’s lap.

(Mac came aboard a bloody mess.) The whaleboat then made for the HERO through the icy chop ready to be hoisted aboard. Hooking on was done too soon, before the HERO could swing around, producing a lee for hoisting, so surges on the hoisting tackle were extreme and the after block broke into pieces. The captain, by this time, had made his lee and the crew of the whaleboat, after unhooking the boat, came alongside with the animal in a stretcher. It was quickly hoisted aboard alive—another female. The wound was a grievous one—into one lung and out the belly. We had hope that anaesthesia could be performed and perhaps an electrode implant but in the hour it took to get her into position and all gear functioning, she faltered and died. Bob Barrett then spent the next several hours working on her brain, which he was able to obtain intact. Other samples and measurements were also taken. I surrendered skeletal materials to the brain work.

By this time we were on our way down Maxwell Channel off Isla Herschel. The pilot tooted 3 long blasts and we knew we were saluting a Chilean Naval outpost. This one stood on a bleak windswept hill, a single house with a flag slapping its pole above. A more bleak outpost one could not imagine. Not a tree nor a person nor any chance of one as there was not good port for a ship such as ours. Six months they spend in such duty. [Drawing]

The HERO made her careful way in Paso Norte of Puerto Maxwell. This fine little port is rimmed with low hills on 4 sides, the lack of high mountains keeping williwaws at a minimum. We passed rocks on one side, slid over a sill and anchored in nearly the geometric center of the bay. Isla Jerdan on our east had never been collected so at 9:10 PM George Harvey, Mickey Barrett, and I rowed to the beach in the dory. It took forever, and our time with useful working light was cut proportionately. The island was not very rich, and very windswept with the 2 trees (southern beech, winter's bark) no more than 10 ft. high and all gnarled and tisted.

On our way to the beach I had the flattering attentions of 2 *Lagenorhynchus australis* who tried to run our bow—in the dinghy yet! They even followed us into the kelp bed, which here is very thick and about 50-75 yards wide around most of the perimeters of the islands.

On shore were a pair of the lovely kelp geese—the male snow white and his mate strikingly black and white—always we have seen them in pairs.

Back on board I helped a little with the plants and with the porpoise and went to bed.

December 3, 1968

Bahia Gretton (off Isla Grevy), Chile

We're all Horner's now. Our track today took us through remarkably calm seas around Cape Horn from the west, past Cabo Decait, to Isla Barnevelt, and thence to Bahia Gretton where we anchored off Isla Grevy (Wollaston Group) in absolutely calm water.

One of our hopes is to meet some of the oceanic species in this area and hence, we try to move around the margins of shallow water as much as we can, weather permitting. The channels have proven the home of the llampa and *Cephalorhynchus* (though he has shown himself seldom enough) and nothing else. Our kingdom for a pilot whale or a ziphiid!!

I looked at the collection records we have for plants and found that Isla Hornos has been collected 3 times—once by Darwin in the 1830's and twice in the 1880's, hence

we did not plan a landing there planning instead to travel to Isla Varnevelt, a low isolated island of perhaps 75 acres extent. We thought we might find a sea lion rookery to add to Anelio's list, and apparently no biologist had collected it. The chart showed a small cove and a sand beach. I had hopes, as usual, that since the island was essentially oceanic we might find the remains of some animal we hadn't seen.

The day was wonderfully calm; only a slow low swell came in from the west as we passed Isla Hermite and could look into St. Martin's Cove, where the BEAGLE anchored with Darwin aboard and the DISCOVERY I later on. The sailing directions say it is a fine anchorage except for winds sweeping down the mountain behind. Hermite is autere—she was dusted with snow when we passed—trees are bushes and most is either rock or moorland coloring the hills dun.

Ahead of us lay Isla Hal, a precipitous rock of an island and beyond it Isla Hors. A long sweep of table land rises on the haunches of the Horn and seaward, facing south, the island plunges as an abrupt 1,000 ft. cliff. No one tends the light so the island is uninhabited.

Everyone was on deck, even poor sick George Harvey (seasickness over and over), photographing this famous landmark. Mickey Barrett wanted to go around the Horn in a dory and accordingly planted himself in the HERO's dory aft. It was such a splendid idea that the dory soon had a full crew, me in the bow peering resolutely into the engine stack, Moosemeat at oars, and McFarland in the stern sheets looking like Cleopatra sailing down the Nile.

On we went past Isla Deceit. At her southern tip we saw a grand rock looking for all the world like a man in hip boots standing in water somewhat over the knees. I decided it must be Backus Rock, and that it represented perfectly a man with water one inch over his boot tops.

The sea stayed calm so Barnevelt was reached easily. The HERO dipped into the little cove, but we looked in vain for much sand beach. There were cobbles and little coves but only on the west end was there even a hint of sand. Bob and Mickey Barrett, Bill Schevill and I put ashore in the dory while Harvey and Shallenberger went in the launch to attempt recording. Watkins stayed on the HERO as she went out under the scientific command of Bill McFarland to attempt capture of any oceanic animal they could find.

Quite a greeting committee came down to meet us as we neared the shore. First came the Magellanic penguins. A raft of perhaps 100 birds swam ahead of us, from time to time porpoising free of the water like sleek black and white fish. As we neared the beach we could see the rocks and the hill behind covered with a standing troop of penguins all looking anxiously at us as we came nearer. Above the cobble beach they stood on soil that extended up into tussock grass as high as a man's shoulders. We could see that between the bases of the tussocks were runways used by the penguins. As we came closer some birds retreated up into these runways and others tumbled out to run down the beach. Their braying, much like that of a donkey, was heard often, particularly when we disturbed them. Those nearest the shore hopped from their boulder perches onto the cobbles and then thrashed and splashed their way into the kelp bed that rims the shore. I suppose there were 50 birds ashore.

All the while imperturbably watching us from some large boulders nearby were 3 caracaras (Forster's caracara)—lovely dark, eagle-like birds with necks spangled with

yellowish dart-shaped feathers (considered very rare and found only south of the Beagle Channel). They gave every appearance of worrying very little about our approach. We made our way across the little pocket beach toward the tussocks. I planned to hike the ridge above to the west end where the larger beach area was located. The tussocks soon discouraged any such advanced notions of possible progress. It proved an almost impassable barrier. The tussocks had grown here for a very long time, piling up feet of peat moss like material around their bases, through which the penguin runs ran. These runs were sometimes 6 ft. below the tops of the grass and filled with wet penguin-dungy slop. I made my best progress by walking on the tussock tops trying to ignore the abysses beneath at each step. Sometimes the grass would yield to the step and one would inexorably slurp into the depths. In a full foul-weather suit and boots all this made for hard hiking. Furthermore, it ran up the hill for perhaps 200 yards. Heaven only knows how many penguins were sequestered in the stuff—but one thing sure—they were safe.

I looked back and could see Bob and Mickey thrashing along and occasionally Bill Schevill's bearded, bespectacled visage would hoist itself above the grasstops. We were all out of breath when we reached sedge land beyond the grass. Even this was up to the knees and not the easiest going. The island is low and rolling, edged in bluffs and stacks, and offshore looks deceptively easy to traverse.

[Radargram of Bahia Gretton Anchorage]

Bill came huffing up from the tussocks and we converged upon a Forster's caracara sitting in a low bush. Thinking the bush might hold a nest we pressed on. He flapped off, literally running on the bush tops like a terrestrial steamer duck, but refusing, for some reason, to take off. No nest.

Many flowers were out on the island. Plants that had not yet flowered on the larger islands or mainland were here in full flower. I suppose this is due to the maritime climate around Barnevelt resulting from the low relief and absence of mountains. Islands with snow-covered mountains must feel their effects. At any rate yellow violets were flowering everywhere—a little orchid was dotted among the sedges and many other plants were collected.

Bill and I could not make the hike we planned as time grew short so we began the trek back, this time traversing the grass much more easily by following the penguin runs even though at times we could not see ahead. We ended by sliding down a vegetation-choked canyon to the beach. On the way we encountered the same little wire-tail Mac and I had seen in Puerto Bueno, much to the north. It peeped an insistent little call and hopped in the bushes within a few feet of us.

Before leaving the island I watched Bill standing on the cobbles while a school of penguins came in through the kelp. they popped out of the kelp right at Bill's feet and then retreated in utter consternation to the water again. Soon Bob and Mickey appeared—very tired from the struggle—and we all rowed to the whaleboat. I asked to be towed around to the sandy beach as the HERO was some distance away. We rounded the rocky cape and saw 20 lobos (*Otaria*) on the beach. Bob and Mickey and I rowed in in the dory. The animals "scrouffed", and lumbered into the surf. They came up all around us, looking reproachfully at us. The old males are incredible beasts—their snouts turn up and their heads are huge—like great sad-eyed hairy bears, only larger and infinitely more ugly. After watching them for a time we retreated to the whaleboat and were towed to the HERO. Mickey and Bob and I prepared plants while the ship steamed

toward Grevy Island where I wanted to anchor and work next. Our watch saw nothing in the calm sea. In fact Bahia Nassau is about as dead as an area can be, it seems.

At Grevy I looked at the magnificent stretch of beach that lines this low part of the island and called for a shore party to look for bones. We sent one crew northward (Barrets, Shallenberger), and Mac and Kenny Bloome and I headed southeast. Our skiff had been accompanied ashore by 2 llampas who raced on all sides of us so we hoped other samples might be found on the beach.

A long walk on a lovely strand produced some baleen whale bones, a skull of a *Lageorhynchus australis*?? and a reasonable plant collection.

The whaleboat had been out on a recording session during all this and was scheduled to pick us up at 9:30 PM (light ends about 2200 here). Mac and I sat on a rock inside a huge kelp bed watching the speck of a boat (the international orange really shows up) pick up the opposite party. Much later it came our way and then Steve began the most incredible assault on the kelp—he got in the bow of the dory—a big muscled giant of a man—and began hand over hand, to pull himself through. Before very long he was ashore and we in the dory. Mac and I paddled back out—a much easier way of negotiation in kelp. In Maine where Steve comes from they don't have kelp.

Anyway—through the increasing dark we cruised to the anchored HERO, her lights shimmering over the calm bay and the moon slipping behind clouds to the Navarin Island side. Shore birds like phalaropes and shearwaters cut as dark shapes past us. Enough is enough and we all hit the sack most gratefully, and very tired.

December 4, 1968

Bahia Windhond, Navarin Island, Chile

If the morning had proved as flat calm as the night we would have headed out to sea to look for oceanic animals, but instead a SW wind came lightly over the low isthmus of Grevy Island and even in that protected water began to ruffle the surface into little whitecaps. I thought it better, therefore, to head northward for Bahia Windhond and Seno Gradi, where we hoped for launch work to listen for the little *Cephalorhynchus* which we know occurs on the coast there, or at least a little to the north on Wulaia. Bill Schevill and I had our usual conference and decided on the plan. Bill and I have a nightly discussion of the next day's sailing, and once we reach unanimity we accost the Captain and often the pilot to lay out courses, and to locate ultimate anchorage. This gives the pilot time to dig into his literature for information on channels, rocks, winds, etc. Bill's and my problem is largely one of opportunity. What wind conditions will allow what work, what topography will allow what work, and what programs are in need of help? We have worked smoothly and easily, having no major differences of opinion. Together we wish for more animals, however.

I stood the watch across Bahia Nassau from the Wollastons. Viewing conditions were excellent; I could see for miles over reasonably calm water—but no cetacean hove into view. We were only accompanied by our usual skuas, wheeling and dipping around the ship.

Early in my musings over the charts of this area (a favorite pastime of both Bill and myself) I had noted a long strand at the head of Bahia Windhond and had noted that the configuration of the bay, wide open to the south, seemed excellent as a stranding place for animals. I had announced I wanted to walk that beach sometime before we left.

Now, with the HERO standing that way, I asked to be taken closer to see if I could look the beach over. It was beautiful—windblown sand frosted the bluffs in the deepest part of the bay, indicating the convergence of 2 sets of long-shore currents, one from each limb of the bay, meeting and cancelling at the deepest part, and probably dumping their load of floating animals as well. The coast looked as good as any for *Cephalorhynchus* and we had passed a colony of about 100 *Otaria byronia* at midbay (they might be recorded for underwater sound)—all these things added up to a combination launch and beach party, with the HERO standing out into Nassau for an attempt at animals while we worked. I put Bill McFarland in charge of the ship, Bill Schevill, George and Watt went in the launch, and the Barretts, Ed Shallenberger and I went ashore. Our shore party divided and went in 2 directions. Ed and I going west and the Barretts east. We hadn't set foot on the beach for more than 2 minutes before Bob called out "whalebones". Sure enough, among the great piles of driftwood were big vertebrae of baleen whales. Before long we had gathered a cairn of memorabilia and began to despair at the amount. I then found the skull embedded in the beach, buried 3 ft. down in places. It, of course, was huge. It would require perhaps 6 men to lift it. Then we found the jaws, each 8-10 ft. long. Then we located parts of a smaller whale, perhaps a pilot whale, and assorted bones of *Otaria*. I added these to the cache as we simply couldn't carry all this.

We looked up and coming toward us in a slow glide was a huge vulture, its primaries poking out, curved up like so many fingers. The bird, whose wings spread 10 ft. or so, came right over us at 20 ft., and I could see the white neck ruff, and as it passed, the white upper wing coverts—a magnificent Andean condor!

Geese were everywhere. Kelp geese in pairs, ashy headed geese sitting on nests amongst the driftwood—most with half a dozen big brownish eggs set in down. Mother would not fly until we were very close. I had asked Eddie to collect some for Bill McFarland, who wants to look at the visual pigments of these amphibious birds. So, he was off, stalking them over the bluffs. When the day was over he had 5—4 kelp geese and 1 ashy headed.

The beach groups split. I wandered off picking amongst the beach wrack and before very long came upon a fine pilot whale skull half buried in the sand. And then another, and another. I felt I had come upon a stranding and sure enough, when the collection was all gathered I had found 14 skulls, 11 in good condition, plus innumerable appendicular skeletal parts. I stacked my prizes in groups of 4 on the beach for later pick-up. This find is an important one as very little is known about this southern pilot whale—many features suggest close lineage with the northeastern Atlantic species, *Globicephala melaena*, and others with the Californian *G. scammoni*. Such a series could go far toward delineating this relationship. A prize indeed.

Along the way I passed baleen whale skeleton after baleen whale skeleton—6 adult animals in all—all apparently the finback whale. The Barretts recorded 3 more. I suspect they are cast-offs from Antarctic whalers working in this area.

Finally the whaleboat came in for a rendezvous. They had recorded *Otaria* under water for the first time, and Bill thought he might have found a southern right whale skull on the beach. This is a very rare animal and would be a find indeed.

Bill Schevill and I rode in with Steve in the dory to pick up the pilot whales. It took 2 trips but all materials were safely stowed in the whaleboat and thence on the HERO.

Then we headed for the suspected *Eubalaena* but closer inspection proved it to be a *Balaenoptera* so it was left on the beach. As vouchers of the big baleen whales I asked to return to the original cache. We rowed in and took a few parts that we thought would allow positive identification, including a big lower jaw. This fit in the door by dint of lifting out the thwarts, placing the bone in and replacing the thwarts. Steve and I rowed back straddling the bone.

Mickey Barrett came in asking if I was interested in some birds he had seen. Of course. He then proceeded to tell me he had seen 7 males and 1 female of the Magellanic woodpecker, a very rare relative of our pileolated and ivory-billed woodpeckers, and a bird we had been asked to watch for, and if possible, collect. It had been seen, some birds at close range, amongst a *Nothofagus* thicket ¼ mile N of Caleta Bevan in Bahia Windshond, perhaps 300 yards from the beach and no more than 150 ft. in elevation.

Only Bill McFarland's group had seen nothing, but with all those pilot whales on board and the material from the baleen whales, I didn't care as much as usual about such blanks. All the each party was fagged out. I was creaking in every joint, wet, cold, and tired. I wolfed down food that had been held for us (we made it to the ship about 8 PM) and then wrote notes and went to bed. A very successful day.

December 5, 1968

Bahia Allen Gardiner, Peninsula Hardy

First thing in the morning we set off a launch party, first to attempt to obtain 2 individuals of the Magellanic woodpecker that Mickey had seen near Puerto Bevan, and second to obtain some photographs of the 100 animal *Otaria* colony just to the south of Puerto Bevan. I went with the *Otaria* hunters.

The little rock occupied by the southern sea lions is about 1 acre in extent, low and the home of numerous cormorants and gulls in addition to the sea lions. Of sea lions there is one old male, a couple of sub-adult males and many females and juveniles. As we approached one male began irritably to bark and snap at his females, often a sign of agitation in these animals. Out of water his massive head and neck were even more grotesque than in water. The contrast between these massive body parts and the modest abdomen and flippers was ludicrous. We approached within 50 ft. or so before any animals went into the water. Even then only a few made the trek and the rest remained on the rock looking reproachfully at us.

The day was calm and clear so many photographs were taken quickly before we returned to pick up the shore party which had not obtained any woodpeckers.

On the HERO we set out to obtain a live animal for the neurophysiologists. I decided we would keep the launch onboard and spend the whole day for them because it is impossible for us to work for live animals without the assistance of the launch. Trying to deal with a powerful animal like a porpoise is extremely difficult from the dory and I won't ask Mac or others to try, so if we were to get a live animal we had to pack up launch and HERO and concentrate solely on that. Out of Bahia Windshond and into Nassau Bay we went, finally heading toward Bahia Tekenika (Yaghan Idian for "Whatsisname?"). I thought we had our best chance with the harpoon gun trying to shoot an animal in a non-vital region. The schools of animals are simply too small to stabilize the animals that ride the bow. Anyway, we headed into Bahia Tekinika, a lovely deep fjord rimmed with snowy peaks of the Pasteur Range. In the mouth we encountered a

pretty good school of porpoises, once again *Lagenorhynchus australis*. With Mac in the bow we tried everything in the book—head grabber, harpoon gun, etc., and nothing availed us. The animals began to get wary and refused to run the bow, but instead gathered at the waist and around the stern. Mac and Eddie transferred their activities there, setting up station on the tethered dory. Before very long Mac fired and announced he had missed, but Eddie threw the buoy in anyway. Then we noticed it begin to pull against the current. An animal was on. We lowered the whaleboat and took off. The buoy became tangled in the HERO's rudder again and I tried desperately to pick up the harpoon line with the boat hook. No luck. Finally, the buoy swung free and we went after it, shortly coming up with the porpoise on the end of the line. Then followed one of the usual wild melees in which the animal was fought to the side and horsed aboard, struggling and bleeding all over Mac who, as usual, landed underneath.

It was badly hit—through a lung and out the ventral surface. But anyway, Kenny and Bob tried to get everything going for an attempt at anaesthesia and were all set when the animal shivered and died in my hands. It was a big male and the engineer (Jerry) told us that Mac had indeed missed the animal he shot at but hit the one swimming beyond. That we reasoned, was why our lady killer Mac, who had shot 6 females in a row, happened to hit a male. Bill Schevill and I began our by now weary process of measuring and flensing. It is a process that takes probably 2½ hrs. when working flat out, and is bloody and not always pleasant. With the same species always coming across the dissecting table we are getting a little blase.

We had chosen Bahia Allen Gardiner as our next port, one that was not sounded on the chart and hence one that we would have to enter with caution. It lies on the south shore of Bahia Tekenika, the bay mentioned before. The first capture has come in Ponsonby Sound. A big school of llampas appeared.

This time I put Eddie down in the pulpit. He had to vindicate himself after his previous misses, though he said nothing to me. We tried the gun and he missed when the animals crisscrossed the bow. The school numbered at least 15 animals and they were beginning to crowd one another at the bow, which gives us our best chance. Eddie switched to the hand harpoon. He struck and the animal rushed off throwing the harpoon, and losing the pole. Tough luck. We switched to Bill Schevill's hand harpoon, which is purposely short for the whaleboat. Eddie struck again and the harpoon pulled free. Still they came. I announced I wanted a turn after Eddie's next shot. This time he didn't miss and off we went in the whaleboat after an animal struck on the side.

We horsed[?] the animal in in rough water. It was small so we easily hauled it aboard. I disengaged the harpoon and could see that the wound had tipped one lung, even though the harpoon had bounded free. We brought it on board and put it in the surgery where an attempted was planned for a brain implant.

Then followed a long and harrowing set of attempts to entubate it to hook up the respirator. All went well except that the animal was so small that no one had a hand small enough to reach down the throat, remove the aretynoid extension of the larynx, and entubate it. We even had the Captain down trying. He failed after a most valiant effort. I suggested we try to nembitalize the animal and hope that the relaxation induced by such anaesthesia would allow entubation. Bob gave the animal a shot. It didn't work and our animal was slipping into anaesthesia from which we could not lift it. Finally, Ken, whose hands are pretty large, but who is experienced, tried. Shortly he succeeded and the

animal was put on the bird respirator. Bob then began work and was able to place a very long large core hypodermic through the skull and to lower a gross electrode through into the brain. We obtained some potentials but after nearly 7½ hours on board and 1½ hrs. under anaesthesia the animal began to fail and died.

It was midnight and we were all terribly tired. So off to bed. The experiment, inconclusive as it was, was a great success as we had been able to prove the usefulness of the hypodermic brain probe, which completely eliminates the difficult and bloody operation usually encountered in such brain implants. In the normal work a section of skull is removed and one must go through a blood sinus which is extraordinarily difficult. Our substitute took 10 minutes and was essentially bloodless. It will make my future work vastly simpler.

A word about Bahia Allen Gardiner. It is named for one of the first missionaries who tried to colonize Tierra del Fuego, but who perished of starvation at Spanish Bay east of the Beagle Channel. He probably never saw this bay and it is merely named in his honor. It is a beautiful harbor—calm waters, wooded shores leading up to the rugged snow-crested mountains behind. Eddie went ashore with some of the crew and returned with a whole boatload of baleen whale bones.

December 6, 1968

Puerto Inutil, Navarino Island, Chile

With breakfast we hauled up anchor and stood out into Bahia Tekenika and headed across a corner of Bahia Nassau for Seno Grandi. Bill and I had been looking at this deep inlet on the charts with the hopes that we could work it over in detail. Our hope was that the HERO might be able to enter it and to anchor inside but both of us understood that chances for such pioneering were small so we had an alternate plan waiting—namely working it with a whaleboat party while the HERO tried for animals outside.

Accordingly, Bill Schevill, Watkins, and I got gear together and with Penny shoved off in the whaleboat once our suspicions had proven correct. The captain had previously sent out the whaleboat and made soundings of the entrance, finding it deep enough, but pretty narrow. He and the pilot decided against it. At any rate plan 2 went into effect.

It was a lovely sunshiny day with the high snowy peaks across Nassau all gleaming in the sun, but with clouds to the north. Right in the mouth of the Seno we encountered the largest (18 animals +/-) and most cooperative school of *Lagenorhynchus australis* we had yet met. They swarmed around the whaleboat riding the bow and cutting along within a couple of feet of those leaning over the prow. I could see the mid-dorsal white mark running from behind the blowhole to the base of the dorsal. It is faintly evident in animals out of the water and Bill and I have been arguing about its origin. I think it's partly pigmentary but also suspect that differential translucency of the skin has something to do with it too. It seems to me that light may be partly polarized under water and thus reflect back, producing or enhancing these pattern marks that are hard to see in air—we have noted other such marks—on pilot whale heads, saddles behind the dorsal, etc.

In support of my notion I was reasonably sure I could see the position of the mid-dorsal mark shift a little from side to side as the animal rolled under the bow. It bears more looking.

At any rate, we stopped and Watkins dumped his hydrophone over the side and almost at once began to record click bursts, and a kind of lower frequency click train. Then he recorded a sort of bark, composed of rapidly repeated clicks. This was the first really successful recording we have made of this quiet species. The large number of animals, and the nearness of them to the hydrophone (they nearly touched it several times) accounted for our success. Inshore species such as this often seem to produce very low-level signals. The same is true of the harbor porpoise and others, perhaps even *Cephalorhynchus*, though we still haven't heard it speak at all.

Nearby in the kelp were a dozen or so young southern sea lions so we moved over close to them and recorded again-picking up some underwater signals from them.

The water was flat and glassy and below the surface there was very little noise to interfere. Marvellous recording conditions for such a low-level beast.

On into the bay we went, through a maze of wooded islets. Steamer ducks were everywhere. Sometimes we encountered large groups which went steaming off down the channels leaving their broad white wakes. Our porpoises followed along until we were well within the Seno before turning back for their entrance again. *Lagenorhynchus australis* is certainly an entrance animal—if one wants to meet them the chances in the swift water or a confluence of 2 channels are much greater than elsewhere, or in the entry of a canal into the sea, or in a narrows where tidal currents whip along.

Like everywhere else we have been in Tierra del Fuego this place is essentially uninhabited. The chart lists an estancia in the upper parts but all I saw was a little cabin. No boats. In fact the last boat we have seen was in the Canal Magdalena just as we turned out of the Straits of Magellan. There we met a small fishing boat but in all the days and miles since then not a skiff even has been seen, except on the beach.

Once the llampas left us we cruised along close to shore looking for *Cephalorhynchus*. As I know them from experience farther north in Chile they swim within a few ft. of shore most of the time and seldom leave it. Finally, deep in the bay we encountered a school of approximately 7 animals, including a young. They were, as predicted, within feet of shore. They avoided us resolutely. No sounds could be heard. Finally, abandoning the sound work we set about trying to catch on. I suggested I go ashore with the shotgun and that they try to herd the school past under my vanage point. All went well until the animals were within a couple of hundred yards of me and then they dove and disappeared for a very long time. When next sighted they had abandoned their shore hugging tactics and appeared far out in the bay going like the wind away from the boat. The boat took up the chase but lost them in the open water. I watched all this and in the interim collected a few plants and watched a magnificent blue and rust-colored kingfisher with a big crest. He sat peering at me, only a dozen yards away.

The weather had turned on us and we began our trek back in blustery winds and ice cold rain. Two or more groups of the little porpoises were sighted but nothing we could do brought us within striking distance.

Our hourly radio check with the HERO told us that she was outside (it was 4PM), so we replied that in something less than an hour we would emerge, and so set out to keep the schedule. In the islands near the entrance we passed what might have been a

Yaghan Indian habitation. Phylly tells me they are temporary shelters of fishermen or shepherds. All along we have been seeing shell mounds near shore, mostly of mussels, and these likely are of Yaghan origin. This one had its mound of shells, fewer than most, and a house as well—a hogan-like affair of rude planks propped up on a central frame—the whole could not have been more than 8X10 ft. inside, and the rain was sweeping in freezing sheets past it and the channel in front was ruffled by the cold wind. A bleaker, more inhospitable place would have been hard to find, except for the trees behind.

I shot a steamer duck for Mac's visual pigment work. It took a charge of buckshot to stop one since they take off at quite a distance. When we picked it up we looked at a ponderous bird with short wings, obviously too short to raise that body into the air. On the terminal joint of the wing were 2 cartilaginous excrescences that looked like stubby yellow fingers. These, we suspect, are used when the bird climbs out on land. They are often seen snoozing on the rocks along shore and do go some yards inland. The legs and feet are very large with 3 toes completely webbed, plus a little separate toe, that is paddle-like. I think the main motive power comes from the feet with the wings beating simultaneously down and somewhat backward upon the water, lifting the heavy body enough that the feet can run, which they do alternately. The very heavy muscles of the hind legs attest to their importance in this peculiar mode of locomotion.

Before long, through cold rain and in strong swells we came alongside the waiting HERO and were hoisted aboard. The hoisting operation in a sea way is getting better—the ship more often swings around to produce a lee for the whaleboat, more often keeps a little headway, more often the bow painter attaches first, swinging the bow out a bit while the stern falls are hooked on, and the hoisting itself is uneventful now.

The ship left at once for Puerto Inutil, just north of Wulaia, and arrived there 2 hours later. This port is the most completely landlocked we have yet occupied. It is entered through a narrow deep channel that opens into a sizeable rounded bay, absolutely calm, with wooded hills coming down on every side. A lovely place that we fail to find a reason for its name—inutil, or useless. Looks like home to us, and a safe one at that.

Bill and I faced the increasingly onerous task of measuring and flensing the last porpoise. We were tired and wanted nothing better than bed but manfully marched up to the deck and 2½ hrs. later it was done—salted and stowed. Then, notes and bed.

December 7, 1968

Bahia 14 de Julio, Isla Butto, Chile

The shore party went over again early to obtain some samples and to try to photograph the steamer ducks which are very common in Puerto Inutil. They are mostly accompanied by a fleet of little ones that steam along behind when frightened, or gather together into a little ball of birds and crouch on the water surface completely quiet. I watched a group of these little fellows, still in their juvenile down and stripes, go through the same motions as the adults, except that they lacked any primary feathers and so, beat their little wings ineffectually on the water surface while their feet did all the work.

One could see the big hind feet running on the water surface. Like the adults, these little fellows “steam” with the neck erect and the head pointing forward, in exactly the same position they occupy when swimming quietly on the water. We noted, also, that the steamers can trim their buoyancy, probably by adjustment of air volumes in the lungs

and air sacs. Sometimes one saw them swimming at “periscope depth” with none of the body out and only the neck and head above the water.

Bill’s Watkins and Schevill and Anelio and I set out on a launch party that was to last all day, while Mac took the HERO out for porpoises in Bahia Nassau. We began by cruising the shores of Bahia Inutil, watching the HERO negotiate the narrow channel. It was a pretty sight—the fine ship green and orange slipping between green mantled cliffs in a calm narrow channel, white-capped peaks beyond.

Our main mission today is to pursue the little tonina, or *Cephalorhynchus*, a species I have harpooned north in Valdivia but which we have only seen here. Since Wat saw them in Wulaia we hope to find more in the area.

We skirted the shore out toward Murray Narrows, where I hoped the current and whirlpools would attract them. The main fare on the way out were birds. I had been asked by Bill McFarland to collect some Magellanic penguins for him so that he could sample the visual pigments (he has special interest in amphibious birds that must see both in bright sunlight and below the surface). Consequently I manned the prow while Steve steered us in toward them. Many were seen floating on the channel surface. They were seen usually in pairs, but sometimes in groups of up to a dozen birds or so. Usually they duck below the surface when the launch is 35-50 yards away but occasionally would remain on top until we were no more than 40-50 ft. away. I shot when they were probably 30-50 yards away and am sure that they were able to duck often before the shot hit around them. Only by using buckshot was I able to collect them with any frequency and even then, usually missed. On board they are lovely birds—their feathers form the most complete protection imaginable—a fine dense interlocking down overlain by gleaming white imbricate feathers, almost pearly in lustre. They need such protection in the 7-8 degree water. I suppose it’s much worse in the winter, too.

We finally swung out into Murray Narrows where a group of southern sea lions was encountered. Listening proved pretty unprofitable and so we moved on, across the channel to the Hoste Island side and back down, crossing over to Isla Strate. There we investigated a group of low rocks on the south shore and located a big rookery of sea lions. Some good sounds were obtained from them after we had disturbed water. The old boys were the most reluctant to leave the rock but finally lumbered in their rolling seaman’s gait into the water. The girls had all rushed off before, and gathered in groups excitedly poking their heads out of the water, bolt upright, to look at us. Then having drunk in our yellow foul-weather clad magnificence, they flipped and dove out of sight.

Anelio obtained a good count with some information on the sexual structure of the colony. The presence of a group of sub-adult bulls, he says, is typical of these groups after the passage of the reproductive season.

It was only a few minutes to pull over toward Isla Button, named for the Yaghan, Jemie Button, who was taken to England and after 2-3 years brought back by Darwin’s group on the BEAGLE. He was released at Wulaia, his ancestral home, and later participated in a massacre of a group of missionaries, I suppose as a way of showing how much he had learned in England. The massacre took place at Wulaia across the bay, and only the cook survived.

We ate our lunch on board the launch as she drifted in the calm water, all pleasant and calm. About this time we saw our first fellow craft in many days—a skiff powered

by outboard cruising over under the cliffs of Hoste Island and making her way toward Murray Narrows. No *Cephalorhynchus*.

We cruised the steep shores of Isla Butto, peeking in on the home lives of shags that were nesting on various precipitous cliffs in the area. The adults are black above and white below, with the entire neck and head black. It is the rock shag or cormorant (*Phalacrocorax magellanicus*), a bird of the southern third of Chile. The little gray-black young clung, usually in pairs, to their nests stuck in the cliff as we passed while the adults swooped off the cliff gathering momentum enough for flight before they reached the water level.

Anelio allowed as how he would like to inspect some islets offshore from the south end of Button where he thought sea lions might gather. We could see one low loaf-shaded rock that was white with guano, often a concomitant of sea lions as well. As we cruised across the still water we noted streaks of dull red below us. Shortly one was seen nearer the surface and we could see that it was composed of swimming crabs in untold billions. They were swimming in layers, often only one crab thick, but covering acres and acres, all jammed next to one another. The schools advanced along sharp fronts, like fish schools, with schools passing over one another, or streaming along in narrow bands. Sometimes they dimpled the surface, and all over the bay they were being eaten by thousands of sea birds and sea lions. The rocks of the loberias were red with them. I suspect the schools must have extended over at least a mile of sea in each dimension. They began to come in our scuppers as we stopped to snatch up some samples. They swam backwards, swinging their chelipeds together. On the inner margin of each claw was a fine sieve of cirri and with each swing of the chelipeds I presume brought the cirri into juxtaposition over one another forming a mesh of fine pore size. Anything collected on it lay right next to the mouthparts.

The crabs were uncommonly easy to catch. One could choose a nearby crab, lower a hand into the water, and usually scoop it up. It was as if they kept such rigid station that no attempt at avoiding your hand was tolerable behavior. I noted that asymmetrically on the abdomens of many was a large swelling, lighter red than the rest of the animal. I did not determine its cause though many of these we collected had the swelling.

Sure enough, on Don Anelio's island we sighted a large loberia. There were large groups of young males, all gathered together in a sort of *Otaria* YMCA, older males, and whole areas seemingly only of females. Young animals were in evidence. Once again we listened, and once again were able to record some underwater sounds, though not many. Anelio happily counted and observed while we played with the tape recorder and such.

Then we took the launch across to the mountains south of Wulaia and made our way up along the shore to Wulaia. A brief social stop was made to say hello (or hola) to our friend at the sheep station there. He offered us another lamb (which we refused) and seemed pleased we had stopped. His little bright-eyed daughter Hilda was especially pleased when Bill (Schevill) remembered her name and greeted her by it.

There in the mouth of Wulaia were 2 *Cephalorhynchus*, cruising along in their unobtrusive manner—one adult and a half-grown animal keeping close station. We approached, shut the engines down, and listened. Not a sound. One seldom hears anything from these small groups of animals. At one point they surfaced within 50 ft. of

the silent launch. I could clearly see the dark-gray pattern mark that sweeps up on either side of the head meeting asymmetrically at the blowhole. This was characteristic of the animals I took at Golfo de Arauco and Valdivia, and makes me reasonably sure we are dealing with the same species.

After this encounter we stopped trying to record and attempted to make a capture. Like it was in a script they refused to let us near. They surfaced in one direction and as we approached that place, dove and came up far in another direction. If the sea had not been calm we would have lost them at once and eventually did. All this was wary behavior indeed as we had not pressed them during our recording attempts. Bill Schevill, who has yet to see these animals out of water, was especially sorry to quit when the HERO arrived but I knew we were licked and the belts had begun slipping on the launch so deemed it best to follow her across to Isla Button where the evening anchorage was located.

I shot another penguin for McF on the way back and other than a brief survey of the anchorage for the Captain nothing else eventful took place on our last day of hunting in the Nassau Bay area. Tomorrow we begin the trek back toward Punta Arenas.

December 8 1968

Caleta Brecknock, Seno Ocasión, Brecknock Peninsula, Chile

We're on our way home. We will have one day more in the Punta Arenas area and then hit port early on the 11th. It has been a fine trip. We have accomplished a good deal, though the porpoises proved much scarcer than we had hoped, but then, studying porpoises is like that—only once in a while can a person find many at once to work with.

The ship hove anchor early and made her way through Murray Narrows, giving a 3-toot salute to the Navy observation post there. As usual, my watch on the flying bridge was not notified and was lifted half out of his shoes. It was poor George Harvey, who last time was tying his shoe, and bending over in front of it when the toot came. I hope something is done to move this horn so it doesn't cause such mayhem to others.

We had a meeting regarding packing and cleaning. Remembering sad experiences of coming in after another party on the *Helix* I asked that everything be made as clean as we found it and that everything be packed before we hit the dock at Punta Arenas. Accordingly, packing was started and cleaning started by the scientific party. I spent my time writing my impressions and suggestions of the HERO operation for NSF, and in getting materials for a report together.

The clouds had lifted over the Beagle Channel and unlike our other passage we could see the majestic mountains and glaciers in their entirety as we passed.

As we passed the first Chilean fjord west of the Argentinian frontier an LSM came out and followed off our quarter, tooting. I listened and finally told the pilot about it. He said they weren't calling us and steamed on. It later turned out he was angry at being tooted at and was ignoring them. He wanted messages by signal light as this was the custom. Finally the ship astern grew patient and the pilot [drawing] was drawn out on the bridge wing. He and the Captain of the LSM exchanged hot words—the LSM man angry at being ignored and our man angry at being called in so gauche a manner. The LSM, with all hands standing at the rail, finally cut away and retreated up its fjord.

Our trip was through flat calm seas. I picked out an anchorage area near Isla Aguirre, a locality that has never been collected. The pilot was able to oblige me by

pointing us toward Caleta Brecknock, about 2 miles east of Aguirre. We plan a launch party before breakfast tomorrow morning as our arrival will be very late.

Our passage continued calm and clear, allowing views of the Brecknock Peninsula that we had missed on the earlier traverse. The skyline is one of jagged snow-covered mountains and the foreground of lower granitic promontories and islets, mostly exposed rock, highly smoothed and worn by glaciers. Cirques are to be seen near sea level, sheet jointing is common where the rocks spall off and the vegetation is tucked in folds and crevices. The copses of trees lie against the rocks and are gnarled into their contours. On the forest edges one can see that the trees are tiny—like those of a Japanese miniature. I believe only 2 trees make up all or certainly the majority of these forests—the winter's bark, and the southern beech.

The anchorage was reached while there was still light—at about 2200. We slid up a glassy fjord, the Seno Ocasión, between granitic walls. These ramparts grew higher as we pressed back into the deepest recess of this channel. All around was bare spalling rock, laced here and there by cascading water. By the time the anchor was dropped—in 30 meters of water, the rocks crowded so close around that only 150 ft. of cable could be put out. We found a big buoy with heavy chain below and a long polypropylene cable was taken out in the dory and attached to it to secure the ship with its inadequate scope. Also it was prudent to control our swing with rock walls all about. Behind the peaks the sky grew red, dusting the clouds, with the last fading light. A magnificent setting, like anchoring in an alpine lake. [Drawing]

December 9, 1968

Chile, Bahía Gente Grande, Tierra del Fuego, Chile

A calm lovely day with the many snow- and glacier-clad peaks of the Cockburn and Magdalena Channels standing clear against the sky in contrast to their peekaboo shrouds of fog and mist on the southward journey—but I had little enough time to notice. All the preparations for leaving are in full sway—cleaning labs, packing gear, seeing to the stowage of our collections. I had the additional duty of trying to prepare a written report for the Captain and was feeling a little under the weather with some sort of stomach upset, so spent most of the day in the room below, typing.

We planned a long traverse that would put us in good position for the last day's effort in the second narrows of the Straits of Magellan, a little way past Punta Arenas. Accordingly, near midnight the pilot picked his careful way among the buoys into Bahía Gente Grande, named for the now extinct Ona Indians who apparently confronted one of the early explorers here. The land around is low pampas and there is little to attract the attention—low bluffs cut in some sort of soft sediment, and the grassy land behind.

We will leave a clean ship. Everything will be washed and swept and gear will be returned.

December 10, 1968

Bahía Whitsand, near Punta Arenas, Chile

What a final day for our cruise!! All during our previous days we had been seeing little but the ubiquitous llampa, and he seldom enough. Today we spent in the leaping bowriding, stern-inspecting hoards of the Commerson's porpoise, *Cephalorhynchus commersoni*. It went like this. At breakfast time the anchor came up and we slid out of

low Bahia Gente Grande into the Straits, and there headed eastward toward the second narrows, a few miles away. Llampas greeted us once, and I expected only more of the same until Bill McFarland yelled down from the bow that there was a porpoise ahead and it seemed different. Just then one leaped 150 yards ahead of us. I caught a flash picture and when decoded it was of an animal pure white in the body, with black head and pectorals, black dorsal and tail. It had no beak. It could be but one creature—so I called out “Commerson’s porpoise”. All day long these playful tiny porpoises raced in to swim along the waist of the ship, at the bow or to dive down by the rudder. They are one of the most beautiful porpoises I have seen.

The groups were mostly modest in size and seemed to be rather loosely organized. They might come in toward the ship as a fairly cohesive group of up to 7-8 animals, but this grouping would usually quickly break up into subgroups. The little fellows were seldom more than 6 ft. long, and adults were sometimes smaller—I would guess 5 ft. They often leaped free of the water. One could see pairs of them racing along underwater, showing as greenish-white blobs moving along very rapidly. When they leapt or when they approached closely one could see the black marks. With a few white caps they become very difficult to see very far away.

Mac collected one for us—naturally a female. We brought her on board and were able to dark-adapt her before giving her an overdose of anaesthetic. Mac was able to obtain the best possible material for his work in this way.

Shortly, in the second narrows, we put the whaleboat over for recording sessions. They had animals all around them for more than an hour, and may have had them touch the hydrophone but seemingly, the animals were silent. George thinks he might have something on his high-frequency tapes but it will take analysis back home to be sure.

Meanwhile on board the HERO we were trying to obtain another animal. Mac missed shot after shot—probably statistical retribution for his excellent previous shooting. He couldn’t hit his hat, and furthermore, the damned beackets broke off the harpoons with maddening frequency. I finally took over, missed a shot, and then hit an animal that was dead before he washed past the stern. The harpoon had pierced his heart and he died instantly. It was a male, and proved to have a peculiar serrated edge on its left pectoral. One wonders if this is a normal secondary sexual character, or simply an anomaly.

Watkins told me of the unusual flexibility of the neck in these little porpoises as they circled his hydrophone and looked up at the boat occupants. It will be worthy of a look at the cervical skeleton to see if there is anything unusual there.

The little porpoises were concentrated in the narrows. Considerable steaming in the broad bay to the east produced no animals and the time spent cruising before we reached the narrows produced only the lllampas mentioned previously.

We steamed back, heading for anchorage near Punta Arenas which we will reach about noon tomorrow. All the gear had to be repacked as we had hauled out all sorts of things in our frenzy with the Commerson’s porpoises, and I had to finish preparation of both animals. All was secured in time for an end of the trip party in which we presented Captain Hartshorne with a nice cow’s horn made into a trumpet, all signed by us as a grateful recognition of taking us safely around the horn. Anelio produced a grand effulgent Chileno toast and I did my rather drab best to toast him and the pilot. I wanted to toast the whole crew, who have been so marvellous, competent, and helpful during the

whole voyage, but somehow the gruff male attitude makes it difficult to produce such naked thoughts. Anyway, they and the Captain are great and competent folks and it has been a real pleasure sailing with them. Seamen all.

December 11, 1968
Punta Arenas, Chile

It took till noon to reach this sprawling red-roofed town of 60,000 set on the gentle slopes of a grassy hill. We tied up alongside an icebreaker and shortly my family and Berit Bloome showed up at the rail, all smiling and happy after a wonderful 2 weeks in Harberton, where they had been hosted by the Goodall family, owners of the Estancia there. Natalie Goodall was there too, and when they came aboard she looked happily at our 1,700-plus plant specimens. Next through unloading and then we leave for Santiago and home.

We had a feast at the Club Austral with toasts and such and made our various ways home—I to the boat and Phyl and the kids back to the hotel as there was no extra room there. Seems strange.

[Flyer insert about the HERO, map, and letter from Phil Smith to Ken]

December 12, 1968
Santiago, Chile

One of those hectic days with me dragging awfully. Ship unloading—all the hectic business of customs when one never knows if he is going to make it through or not. We did, thanks to Anelio's Spanish, without even overweight, and we had a horrendous pile of junk, too. Thence off to the plane and the long flight to Santiago (a stop in Puerto Montt). Francisco met us there and whisked us through and delivered us to, of all things, the Hotel de France. A mix-up in the office made them think we wanted this cheap walk-up with the john down the hall when we really wanted a spiffy room and bath with air conditioning, particularly in this heat.

December 13, 1968
Santiago, Chile

I dragged more—terribly weary I think, in accumulated fashion, from the trip and the events of the trip end. All paperwork—old bills to be settled, skulls to be obtained for Carl Hubbs from the Santiago Museum, and endless other affairs.

December 14, 1968
Santiago, Chile

At 12:15 we were down on the street amid the torrent of foot traffic that typifies Santiago—in L.A. all of them would be in cars—with all our luggage stacked behind. Francisco came scooting up ½ an hour late and we had to run across the street with everything to his car, illegally parked and race off into the death-defying swirl. It's dodgem cars with only occasional contact.

Easy time at the airport and then a long uneventful sleep-filled flight to Lima—where I saw the beaming face of my old roommate Hersh Peak leering down. He's now first secretary in the embassy here. He speeded us through to the Hotel Maury—old

home to us and then to his lovely house in the suburbs where we met Gale and the kids, had a fine evening of reminiscences and back to the hotel.

December 15, 1968

Iquitos, Peru

Our plane left early (up at 5:45, airport at 7, flight at 8) so we pulled ourselves out early without breakfast and grabbed a taxi. [Insert—flyer about Iquitos, Peru] Our flight was mostly cloud-shrouded though we did catch glimpses of the altiplano, the canyon country with its little stamp-sized areas of cultivated land surrounded by stone fences, terraces on the steep slopes, rock corrals full of animals and villages clinging to mountain spurs up where one wonders how they can obtain water. The clouds broke again and we were over the jungle—the vast unbroken forest—the same as I flew over in Brazil. Only occasional hills broke the level[?] and only an occasional twisting river wound like loops of rope brown through the green. Cumulus clouds spread in lines like puffs of cotton, attesting to the heat below.

Our plane stopped at Pucalpa, a raw frontier town dealing in oil and forest products. We looked out briefly, watched them gas the plane from a dump truck (a big rubber tank jounced and jiggled in the back and was pumped by a little Briggs Stratton pump into a strainer held in a funnel sticking into the wing tank).

Iquitos was reached an hour or so later—a jumble of houses on a peninsula jutting into the brown Amazon. Even from the air we could see the current was swift—debris and water hyacinths sweeping along amongst the various wooden boats.

A taxi took us, and our blissfully reduced luggage, to the Hotel Turistas, that fronts on the river. Iquitos is pretty undistinguished—a mixture of old ornate buildings of the rubber boom—all metal work and fancy tile, more modern plaster, wooden or tin houses—one storey for the most part—and thatched shacks on the outskirts. Most of the streets in the main town are paved, city squares are modern with the usual “tonto grave” generals in bronze, suits of clothes much too heavy for the jungle and curly locks. The fountain plays amidst the most garish combination of colored lights since Wurlitzer.

Our hotel is modern and nice with big cool rooms, modern bathrooms, and a splendid view.

A walk in the park, mostly devoted to collecting moths, with a little listening to the ghastly military band, a dinner with colona juice (a delicious fruit of the tomato family that tastes something like orange juice, but better). Then to bed ‘neath the air conditioning. It’s not too hot outside though, even though we are just a few degrees below the equator.

December 16, 1968

Iquitos, Peru

After breakfast, at 8:30, we were met by a spare young man who led us to a boat dock north of town where we piled into a speedboat powered by a 60 HP Johnson outboard. We were soon speeding down the Amazon, dodging floating trees and bits of debris. Like all river trips it was an unfolding panorama of vignettes. Women washed at the edge of the muddy stream, crouched on the mud that stepped up into the forest, showing where the river had receded. Back of each woman was a series of mud steps cut in the bank and a thatched house on stilts. These houses had half walls inside, marking

off the living quarters, a gaggle of chickens, pigs, Muscovy ducks, and various birds. Usually there was a long dugout, the keel and bottom hull formed of a single tree and the sides of planking lashed and caulked above. The heart-shaped paddle is used by all and one often saw 3 or 4 people in such craft, rowing along with an inch or two of freeboard, as if a wave would sink them. Sometimes a woman or girl bailed so industriously that one knew if she quit, the craft would sink.

As we went by the kids waved at us like boys and girls at the engineer on a train. We waved back.

The forest is largely scraggly here and all along the banks are little farms where the forest has been fragmented—a tall lupuma tree standing alone in a field, dripping with epiphytes and lianas—mementos of a wider forest now gone. Guava trees were in full white bloom—like the lilacs of home—and cecropia trees and palms stood spindly and alone. Back of it all, though, and intruding now and then to bank-edge stood the immense continental forest.

We watched the long, slim thatched-roofed colectivo boats putt-putt along, taking people home or to Iquitos, just as taxis do on land. Some bore families with chickens and pigs, some with the outhouse lashed crazily on the long overhanging stern, often with hammocks slung inside and the smoke of the cooking fire issuing from the thatch. We waved. A brief tenuous link of our world with theirs. How could they know us or we them? What we see are cardboard figures cut hastily and even in silhouette, out of proportion.

Rain came in a gray mist ahead of us. The boat man clutched a tattered plastic raincoat about him and I gave Joe—the cook—mine. It turns out they prefer plastic tablecloths as they are airier—tied in a square knot around the neck.

The kids, Phyl, and I retreated inside and watched it blot out the landscape on the windows and windshield as we sped along.

Two hours later we pulled up in front of one of the thatched houses, clambered up the slippery mudbank and into the house of the local store owner. The store is not much—it contains a few essentials like kerosene lamps fashioned of milk cans, sugar in big rectangular cubes, and a few other things. Beer in big bottles was available. The house was open to the air, dry and comfortable with the rain tapping on the thatch and running off the eaves. A cook fire smouldered behind on an earthen mound and made the thatch all black above. Meat, we were told, was hung near, and the fire hardened, partly smoked and preserved it. Wild boar was used as well as monkey and below us scuttled the pigs and chickens as well as a tame bittern and 2 trumpeters. Nancy, of course, made friends with the trumpeters and her triumph was to scratch them on their heads and have them put up with it. Various things of the Yagua Indians were tacked up on the walls. These Indians number some 2,000 people, all in this area. The ones nearest the river are a mixture of acculturation and old ways. Back farther in the forest they live as always and survive an 80% child mortality. Our host, Peter Jensen—a bearded University of Minnesota archaeologist, turned tourist entrepreneur, led us through the forest to his forest camp. As we walked through sugar cane and corn fields he pointed out the beautiful flame-colored bromeliads in the standing trees, showed us how sugar is boiled from the syrup in ancient flat pans after been run through a press operated like an areastre, with a big log arm that is pushed in a circle by workers, turning the press. The kids enjoyed a segment of cane. We walked on and Peter called in Yagua across the

creek. What he likely said was in effect “Get your clothes on and come visit us at the camp.” He told us he had invited them to the camp.

Our trail led us to a thatched house in the forest. In its open veranda were half a dozen Yaguas, an old old man in full regalia lying in his hammock, 3 women weaving on the floor and assorted little kids including Peter’s godson, who ignored him. the women were taking palm fiber pulled out like wool, holding it in their toes and pulling it taut across one brown thigh where they rolled it back and forth with their palms, producing a tightly laid twine that was very very strong. This was then stretched on a sort of crochette hoop making a loosely woven bag for carrying.

The clothes of the people were a heavy fiber skirt dyed in horizontal bands of reddish buff, a chest piece for both men and women hanging loosely and covering down to above the navel, a round corona of woven palm on the head with a mat of fiber over the forehead like bangs. The girls wore anklets and knee bands of fiber. All were banded reddish buff. No shoes. One nursed her baby and one wore a loose cotton dress.

We thanked them in Spanish which at least some understood (they also spoke Quechua (from the missionaries) and Yagua), climbed down the notched pole ladder, and made our way on into denser forest. Soon we emerged in a clearing where the “camp” stood—a series of 5 thatched buildings—beautifully made palm thatch, compartments and hammocks for 42, kerosene ice boxes with beer and soft drinks, and a couple of nice English-speaking Peruvians to tend your every want. We sprawled on the veranda, making friends with the macaw and parrot and soon the Yaguas arrived. They were all dressed now and gathered on the veranda for a smoke, which Peter provided. He brought out a tape recorder, a new item in camp, and induced them to sing and tell shady stories into it. On replay each dirty word or joke was greeted with floods of chuckles and laughter. The song brought more. Peter bet them they couldn’t hit a cigarette package set in a dahlia across the courtyard, so 2 of the handsome men tried. Their blowguns are shorter and of much smaller bore than the one I got on the Rio Negro. The darts they use for birds and monkeys are of palm and tipped with curare plus other ingredients which they won’t reveal. It looks like thin tar. The blowgun man pulls his dart from a palm leaf holder, pulls a tuft of cotton from another holder, wraps it around the little 6 in. dart about 2 in. from one end, licks the cotton fore and aft, inserts it, holds the gun with both hands on the mouthpiece and a finger extended under the barrel. With cheeks puffed he gave a little puff, almost silently, and the dart flew a good 30 yards. It took several tries, though, to hit the cigarette package.

The guns are made of a split piece of hardwood with a carefully cut half groove in each. I suspect a chalk string is held taut between the 2 as they are held together marking both sides. The 2 pieces are then bound together and glued with tree gum, the mouthpiece put on, and I suspect, the bore reamed with a pull-through reamer of some sort.

We ate a lunch of monkey meat (I found a shot pellet in mine), salad, banana chips, sandwiches and fruit and then went for a lovely walk in the jungle. Nancy, especially, was in constant joy over the moths, butterflies, frogs, and flowers we met. We saw the long pendulous *Oropendula* nests hanging from a tall tree. Several other birds called nearby. Regretfully we turned back and before long were on board our speedboat and making our way back up river, staying near the bank to reduce the current effect. Even so it took us ½ an hour longer to make the trip.

I saw a tuxuci dorsal fin fleetingly but no “buefo colorado” as they called *Ima* here. *Sotalia* is “puefo negro”.

December 17, 1968

Iquitos, Peru

Shopped in Iquitos and bought a Shipibo “grudge knife”—a little blade used by Indian men to settle grudges. They store up their woes for a year or so and then trade slashes at the muscles on the back of the neck—sometimes with fatal results we are told, sometimes with cut tendons and sometimes simply with the production of elegant scars.

Also from the Shipibos, who live up river, came a “curandero’s pipe”—used by Mestizo medicine men during curative sessions in which the patient takes the jungle equivalent of LSD. The mestizo pipes, we were told, are more realistic animal forms than those used by the pure Indian “curanderos”.

We visited an animal shipping company, peering at anacondas, shoebill storks, spider monkeys, and one spitting ferocious margate cat.

December 18, 1968

Lima, Peru

A long wait at the steaming Iquitos airport enlivened by Barb and Dick dickering with a gnarled old lady for 2 pig-tooth necklaces, and they obtained them finally by waving a dollar bill at her and wordlessly she forked them across. Finally, we boarded for the long flight across the jungle through magnificent towering clouds, up into the montane forest—mountains all clothed in dense green without a rock showing. The winding rivers pinched down and became white with current. Off in the distance I could see over a great escarpment into impalpable blue beyond, only the vaguest shapes suggesting land . . . like Shangri-la, a world of unknown rimmed with impenetrable forest, save by generations of forest men and women who made the journey as part of their lifetime.

The forest fell away and the land emerged. So did towns and farms and rock walls and finally over the spine of the Andes with snow, rock fins, and little emerald lakes. Once over, into the desert side it was minutes only to drop down into the eternal cloudbank of Lima.

We made our way to the Maury, freshened up, and went shopping for a few last items. Then a snooze at the hotel and finally to the airport again at midnight.

December 19, 1968

Washington, D.C.

The USA again, folks speaking English, peanut butter, the chance to carry on a subtle conversation, regimented traffic, people whose reactions one understands—in short, home.

After tangles in Miami with missed planes (our luggage was mixed up in Lima and came on the wrong plane), we arrived in Washington—the weather about like that of Punta Arenas—and headed for the Strouts. The end of a wonderful, variegated 6 months—to begin our own reacclimation—South America already relegated to the impalpable past.

Whale hunt on the Alpha Helix, Dec. 1-8, 1971

Magdalena Bay, Mexico, Jan. 25-Feb. 3, 1973

Granite Mts., San Bernardino Co., California, April 6-7, 1973 (class)

Point Reyes, Marin Co., California, April 21-1973 (class)

Bluff Camp, Carmel River, California, Oct. 20-21, 1973 (class)

Santa Cruz Island, Santa Barbara Co., California, Dec. 10-15, 1973 (class)

Granite Mts., San Bernardino Co., California, April 13-May 25, 1974 (class)

Yolla Bolly Mts., Tehama Co., California, June 7-9, 1974 (class)

La Paz, Baja California, Mexico, January 24-February 6, 1974

Whale tracking, Baja California, Mexico, January 19-February 10, 1975

Granite Mts. San Bernardino Co., California, April 10-May 3, 1975

Whale Hunt on the Alpha Helix, December 1-8, 1971

December 1, 1971

Enroute to San Juan Sea Mount, off California

This cruise of the *Alpha Helix* is for the purpose of studying the sperm whale, attempting to affix a depth-time recorder to it, and making observations on other cetaceans that we might encounter off the continental slope. Jerry Koozman, a marine mammal and bird physiologist is in charge. Tom Dohl and I have been invited so that we may learn sperm whale reactions to assist in our proposed capture plans. Dave Gasin, a New Zealander who has done quite a bit of work on the large whales is along. He is presently at the University of Guelph in Canada. Jm Fish of the NUC lab at Point Loma has prepared the instrument packages and may try recording with his special low frequency gear. Walt Garey, my roommate, who is operations officer for the *Alpha Helix* program is out to get away from the phone and to do some writing. Wayne Smith of the local educational television station is out taking films for BBC.

We have a good crew, some of whom sailed with me in Scripps days. I haven't gotten their names straightened out yet but will soon. We will spend about 10 days at sea and no fixed course is yet established though it looks like we will try the Sea Mount and maybe Rodriguez Doma and then turn south if luck is bad. At this moment the weather is gloriously with us. It is crisp and cold but the sea is flat calm with only a minor swell. On the *Helix* this is the greatest of blessings, since she has a smooth round bottom in order to keep from getting stuck in ice, and she rolls like an egg.

Tom and I arrived last night, made our way to the Scripps pier, and finding it closed wondered "what next," but Tom jiggled it and found it merely latched but not locked, so we went in, taxi and all, and unloaded right at the *Helix*. We walked a mile or so to dinner and met Dave Gaskin and then went to bed.

Promptly at 8 AM, as advertised, the lines were cast loose and we set out—but not to sea, instead turning into the harbor to pick up fuel. Sometime while the fuel was coming on board—about 12,000 gallons of it—someone noticed that the mast was bent and that their new pulpit had sprung in when the ship was in heavy seas on the last trip. So, back we went to the Scripps dock for jury rigging—a back stay to brace the rig. Tom

had previously pointed out to me how badly designed it was—I agree and will be a bit reluctant to go into it in any kind of swell.

Finally, about lunch time we cast off again and made our way out into the Pacific, turned up the channel inside of San Clemente Island. We passed an enormous school of *Delphinus*—perhaps 300 animals, feeding under birds. I would guess they were 10 miles off Point Loma at the time. Many had white spots on their dorsal fins, and many had totally dark fins.

We spent much of the time on watch talking to one another—getting acquainted. I felt that Dave Gaskin, particularly, was almost frantically feeling people out—trying to establish himself in our midst by talking incessantly of experiences. He is, I think, contentious and opinionated, but that may pass. Jim Fish is his usual delightful self—easy going, open and direct, quick to enjoy a good joke. I've enjoyed talking to Dale Rice, a quiet field management biologist with a considerable depth of knowledge of whales—in fact more than anyone on board I expect.

We had a nice seminar after a sumptuous meal in which Dale showed pictures of most of the species we might encounter. There are some really staggering shots of blue whales in particular.

A cup of Sanka, worry about how to crack the scotch without raising the ire of the authorities (Scripps ships are rather rigidly dry). A shower and to bed.

December 2, 1971

Cruising over San Juan Sea Mount

We arrived at San Juan Sea Mount today about noon, in overcast but quite calm seas. No whales were seen but a widely scattered school of *Grampus* appeared off the bow and we stopped to record and to listen for sperm whales. The big white scarred grampuses came by in twos and threes, never at the bow but often around the stern very close to Jim's hydrophone. They, as usual, were emitting a lot of squeals and a constant barrage of clicks. One could see their deeply furrowed foreheads clearly, and the tall, often malformed dorsal fins. Underwater they shone light, approaching as light bluish torpedos beneath the surface. Jim happily recorded what he thought was a pure culture of *Grampus* when Jerry noted what he thought was a seal in their midst. Soon we saw a rather good-sized group of *Lissodelphis* traveling right with the *Grampus*. No, Jim won't be able to tell who was saying what on his records.

Later two groups of *Phocoenoides* came to the bow—actually one group of two came in and the others—a larger group—plunged away from us in their peculiar rushing locomotion, and refused to let us near.

Other than these two sightings nothing was seen but birds and sky and swells. Toward afternoon the swells began to rise and by nightfall the good ole round-bottomed *Helix* was rolling according to plan. We began bracing ourselves, going down corridors and in the bunk. I'm not yet acclimated and resorted to the pills a couple of times to chase back the lump in my stomach, and the dizzy ache in the head that presages worse things.

This cruise, like most cetacean efforts in the open sea is 9/10 looking and 1/10 watching the animals you came for. One finds oneself gathering with shipmates in little knots to tell stories over the engine hum, become fidgety, and move off aimlessly for a cup of coffee, or to try to read (which usually induces sleepiness which is then followed

by a nodding head and a cat nap). I'm just enough off to be impatient and bored. I guess that's the word. With eight days ahead it should reach full blown symptoms ere we return. Tonight we head up for Rodriguez Dome off San Miguel Island and thence to Arguello Canyon.

December 3, 1971

Enroute to an unnamed sea pinnacle

During the night the *Alpha Helix* headed northward off gray waters off San Juan Sea Mount toward a rounded rock on the sea bottom called Rodriguez Dome. This dome is at the edge of the continental slope about 20 miles west of San Miguel Island. When daylight came we were skirting the unseen mountain many fathoms below. The ship circled over the area and crisscrossed it. The weather had held and the sea was without whitecaps but crossed by a low rolling swell. To the east a gray wall of clouds topped by a fringe of peach in the morning light threatened to sweep down on us. As the day progressed it did move over the sea toward us and shortly rain began to sweep against the bridge ports and over our improvised crow's nest halfway up the mast. Visibility dropped, and the wind picked up until the water was blotched with spilling white water where the wind swept the crests from passing swells. Down in the furrowed and moving valleys through which we passed kittiwakes and murrelets flew. As the wind picked up still further, driving trails of spray in lines across the sea before it, the shearwaters began their aerobatics. I never cease to admire their flight. In a wind they rocket up in curving arcs to turn and shoot downward in a steep curve that takes them within inches of the water. Then they turn and shoot up again like swift gliders. I've never seen them feed when doing this and one wonders if it is just for the kinesic love of flight.

Later in the day the hummocky outlines of Pt. Conception and Pt. Arguello showed through the haze. The ship had by this time turned up Arguello Canyon, and as we neared shore (the canyon is a submarine one and lay a thousand feet or more below us when we cut into it) the swells rose to impressive height—perhaps 15 ft. or more. This canyon had been the grounds for several blue whales when the *Helix* was here a few weeks ago, but nothing was seen—porpoises and no fins of larger animals.

I stood a last watch in my foul-weather gear and happy for it as the wind moaned around the rigging of the crow's nest as the rain and wind swept by.

Dave Gaskin told us about his *Phocoena* work and I continued to combat a mild malaise with Dramamine D.

We have turned south toward a pinnacle known to Dale Rice where we hope to find our animals tomorrow.

December 4, 1971

Enroute San Juan Sea Mount

A rough day cruising toward a pinnacle of rock that comes up from the sea floor a long way offshore. Dale Rice knew of this sea mount and thought it might be a place where whales congregated. But the weather got worse and worse and we were bucking into a rough northwest wind of perhaps 25-30 knots under overcast skies. Our only companions were sea birds—murrelets, kittiwakes, and black-footed albatrosses. My foul-weather gear proved itself as I was able to stand my watch in relative comfort while the others not so clad, had a more difficult time of it and generally carried out lookout

from the bridge. We turned and headed for San Juan once it became obvious that we were surrounded by storms, and that we could not expect the weather offshore to abate.

December 5, 1971

Off Northern Baja California on the continental slope

Last night the skipper put her in the trough and we rolled mercilessly—a feature the *Helix* does to perfection. My bunk was athwartships and hence I slid back and forth lengthwise until I learned to pile the extra blanket and my heavy sweater in the bunk foot and brace my feet against that and my head against the upper bunk edge. It stopped the incessant sandpapering effect but it didn't promote sleep and one had to brace with each roll.

The day calmed and we cruised southward in pleasant seas but without sighting anything except a school of *Delphinus*. People began to emerge at other than watch and meal times.

December 6, 1971

In the area of Islas San Benitos, Mexico

Last night was a joy as the seas were following and quite low anyway. It felt utterly flat. I should describe the dolphin school of yesterday. We turned in along the continental slope toward San Quintin Bay in what I called the fishhook. It is a series of indentations running north and south where this slope cut in towards land. About 2/3 out on this feature we came upon a school of *Delphinus* spread over about 6 miles of sea—or from horizon almost to horizon. I estimate there were about 300 animals in this area, all in small groups of 6, 12, 10, etc.

Many of these groups came to the bow and others leapt and played rather far from us and didn't make the effort to come in. The groups were very scattered and yet the group was obviously a school. It is interesting that the cohesion of this species allows it to spread so far.

Cruising today was uneventful—through calm seas with few birds or fish. Rather early West San Benitos hove into view—a cone with a base like a flattop—and then Isla Cerros or Cedros, a large island reaching almost 4,000 feet and fringed, especially on its north end, with copses of closed cone pines. We cruised down between the two, raising east and middle San Benitos and then, as we passed southern Cedros we could see the whaleback off Natividad and Punta Eugenia beyond—sere and barren desert.

Off Punta Eugenia perhaps 15 miles we spotted a single whale of small size—perhaps 30-35 ft.—for a long time all we could see was occasional blows but then we saw low views of its sleek black back—but never a fin showed. No one knows what it was. It finally gave us the slip entirely.

December 7, 1971

SE Guadalupe Island, approximately 100 miles

When we woke the ship was over Rosa Seamount, a double pinnacle at the edge of the Continental shelf approximately off Punta Abreojos. We were greeted by a school of *Delphinus*. These animals showed the unicolored dark dorsal fins of the southern *Delphinus* and the frosty gray snouts that also seem to typify them. We turned northward toward home into roughening seas. Off to the west of us a couple of bad storms, one with

35-ft. seas that has just sunk a freighter, and a couple to the north making the area we left unworkable. Actually, we had no choice in coming south if we were to hope to work, whales or no whales.

The water continues green. I think we hit a little oceanic blue today but mostly it has been green and dotted with *Macrocystis* rafts. The major excitement of the day was looking at the molas under these rafts. A couple were pretty large, perhaps 150-200 lbs. or so. Our course took us west of San Benitos and Cedros. The lower San Benitos islands were not visible against the bulk of Cedros, and all were away to the east 35 miles or so. Then we slipped out to sea where no land could be seen.

The seas became quite rough as we bucked into them about noon, but began to abate somewhat by dark. During the night it became calmer still, though a smooth trip north against the weather seems out of the question.

It's nearly always a bouncy ride from Cedros to San Diego. The weather made most of us feel a bit out of sorts; I was able to hold mine in check with a little Dramamine D but some others were not so lucky. In times like these one's routine regresses to an awful sameness. Motivation to be up and about fades. One finds that only certain positions allow one to read or waves of nausea sweep in. I usually react by getting sleepy and lying down for a bit of fitful sleep. My bunk works pretty well where my head is cushioned by a pillow and my eyes don't jerk over the page. I do better with weak glasses than with the stronger ones I increasingly require to read. Unless the book is gripping I find myself going back over sentences again and again and finally dropping the book as my concentration fails. *The Hobbit* or Hemingway work fine but a text on animal communication wouldn't wash.

We have a watch bill that puts us up in the plywood crow's nest twice to three times a day for an hour. I welcome these times, wind or no, as the clean air and cold make you alive again and there is purposeful activity to do. Then one comes down, looks at his watch to see what's next. Maybe a stop for a desultory conversation with someone on the bridge—reminiscing over old experiences at sea or in the wars. Most of the crew and many of the scientists saw service. Then you wander below. If it's 7AM you stop by for some breakfast, even though you don't need it. If not, a cup of coffee will do, and more conversation, often with your scientific colleagues in which you learn about each other—not in big gulps but piece by piece as old experiences, old friends, or acquaintances are discussed—especially the outstanding ones who are sure to have foibles worth mentioning. “Is it true that Pete Scholander hung by his legs upside down from a helicopter over the top of a redwood tree to measure the respiration of the growing tip?”

Personalities emerge but no one forces much. There's too much time and one's resources are husbanded, or let to come out as they might. Then, you wash your cup and take off for your stateroom and a new attempt at understanding the social communication of earwigs, or wherever the animal communication book happens to be now.

Then comes lunch. It is a tour de force. The two cooks Julian and Alex are superb. Each meal is a thing of art and each is different. They stand over the line and urge you to take more, or to return, barring immediate acquiescence. It's a tough life. None of us have much physical to do. Mostly we snooze or walk around bracing ourselves against the multiple motions of the *Helix* (a snap roll and much jerking about in an erratic manner). So, we pick at the delights and try to remember our waistlines.

Then comes another watch. Supper, another tour de force of about the same size as the dinner meal—meat, soup, vegetable, potatoes or rice, a nice tossed salad, drinks, dessert.

Darkness falls and everyone waits until 8:M when there is either a movie or a seminar from one of us. Everyone is invited to these things and many of the crew are the most interested listeners to the seminars.

Then it is 9 or 10 and we retire to the bunk for more earwig behavior or to a shower, or to wash clothes, or jaw with one another in the lounge.

Our scientific crew is a good one—compatible and interesting. My roommate, Walt Garey, is a fish physiologist who works mostly on salmon, but who also discovered that flying fish go into bradycardia when they fly into the air (the same thing whales do when they dive, or when a human puts his face into water, or when a baby is born—the heart slows drastically). Walt is a teacher, an open guy, and is now running the *Helix* program. He is deeply dedicated to it. I like him a lot and enjoy talking with him. Dale Rice, of the National Marine Fisheries Service, has had more experience with northern hemisphere whales than any of us. He is very quiet, full of knowledge of the sea around him—the birds, and other things.

Jerry Koozman of Scripps is a fine respiratory physiologist who specializes in diving phenomena. He is humorous, gentlemanly, quiet, rather easy going but sees that his job is done. I think he is an in-depth fine and thoughtful person. It's been a special pleasure to know him better. Jim Fish, who I have known before, is a bioacoustician who has designed the gear we hope to attach to a whale. He is a very open, down-to-earth guy, full of good humor and a fine scientist to boot. Tom Dohl and Wayne Smith fill out the bill. Tom of course is an old stalwart to me, and Wayne, while fitfully seasick most of the time, is emerging as a very pleasant and regular guy too. So. A good crew. I wish we had more action.

December 8, 1971

At sea, off NW Baja California

The sea calmed last night and by morning there were only swells and little wind. I went up to the bridge after my breakfast toast and shortly spotted a group of thin puffy spouts off the port bow a couple of miles. Dale rather soon identified them as killer whales, and in minutes we were upon them. There were about 15 animals, including one old bull with a tall wavery fin of 5-6 ft. who brought up the rear. We named him Ferdinand for this and set about trying to hitch the instrument package to him.

The whales were lined up more or less behind one another, and as I noted, Ferdinand was at about the end of the line. The remainder of the school included a sprinkling of ages and, presumably, sexes. There were probably two rather small babies—one showing a trace of the lemon yellow instead of white, especially in the spot behind the eye. There were a number of what were probably yearlings, and a couple of very bulky animals with rather low and somewhat falcate fins—we take them to be females, but of course, we don't really know. Then there were two animals with big bulky bodies and fins that stood straight up perhaps 3 ft. These might be young adult males. And then there was Ferdinand. His fin in side view was a tall straight-bordered triangle—perhaps a foot wide at the base and 5½-6 ft. high. In profile the fin was slightly

S-shaped and quavered noticeably both in the wind and as he dove and the rushing water hit its base.

We pursued the animals from 8:30 until after 3 PM, and during that time their schooling behavior changed quite markedly. Their formation was quite scattered at first—covering 200 yards of sea or more. Later, as the animals resolutely tried to shake us, they bunched and instead of trailing in a line they assumed a front that was sometimes like a straight line and sometimes diagonal, bunched or less regular in other ways. For the last four hours Ferdinand always occupied the end of the line, and was noted at both the right and left end. By this time the school had bunched tightly until it stretched over no more than 50 yards of sea.

The school tried a variety of tactics to shake us. At first they wandered near us and didn't seem to take us too seriously until Jim sent a dart into one animal. The animal crossed the bow and the red nylon stretched taut and then elongated 10 ft. and snapped. Its 300 lb. breaking strength meant nothing. Walt didn't toss the trailing instrument pack over because of a mix-up in signals. Then the animals began to dive. We were able to close on them quickly enough. Jim got two more shots, but both failed to attach. One bounced off Ferdinand's fin, and the other went over his back.

At one point the whales tried to outrun us. They almost could. They plunged along, not diving at all, at about 10 knots. Then, abruptly, they ceased this maneuver and began to dive and avoid us underwater. Still they couldn't shake us, though we seldom got near. Toward the end they simply wouldn't let us closer than about 30 flukes and the only indication of diving was an arching of the tail stock. The water is green and very dirty with plankton. We couldn't see the animals more than 8-10 ft. down.

Everyone retired from the chase windblown and cold. The rest of the day was uneventful cruising toward home. We got there late tomorrow afternoon.

Magdalena Bay, Mexico, January 25-February 3, 1973

January 25, 1973

La Paz, Baja California, Mexico

We're off on a trip to catch a whale and put a corset on it. This heroic endeavor will take place at Boca Soledad at the north extreme of Magdalena Bay. Our real objective is to learn to catch, harness and release a baby gray whale as a preliminary to satellite tracking. With us are Tom Dohl, Roger Grutey, Bob Gibson (Franklin Institute), Dick Pierce, and at La Paz we will meet Jamie Dominguez and Mario Camparan of Escuela Superior de Ciencias Marinas, Ensenada, and Jose Castellan of Consejo Nacional Ciencias y Tecnologia, Mexico City.

We drove to San Jose after I almost fouled up the works by waiting at the wrong place—but we made our plane only to miss our transfer to La Paz. It simply took too long to get our baggage and walk across the mall at the airport. But, fortunately, we caught the next plane, only a short time later. The flight took us over the gulf—a beautiful view of Puerto Refugio, Angel de la Guarda Island, Tiburon, and San Esteban and finally Ceralou and Espiritu Santo and then La Paz.

When we landed Ken Balcomb was not there, as we expected him to be. Finally we holed up at La Perla Hotel and had a nice fish dinner in the plaza and hit the sack. My

reintroduction to Latin bed pillows was the only problem. The weather is balmy and lovely. The sun set with a typical fiery gulf display.

January 26, 1973

Lopez Matios, Moclips Cetology Society Headquarters South

Up at 7:30, a nice breakfast and to the bus depot where we waited watching the sopilotes (turkey vultures) by the dozen soaring off to some business to the south. Soon the bus came and we were off to Ciudad Constitucion, a new farming town on the northern Magdalena Plain. It's a 2½ hr. ride over the undulating foothills of the Sierra Giganta. *Cardon*, mesquite, *Jatropha*, *Sinita*, and *Opuntia*, and the desert floor carpeted with orange *Sphaeralcea*. Very lush with recent rains.

At Cd. Constitucion there was Ken Balcomb with truck. The bus and Ken's truck were what we needed to get to Lopez Mateos. We piled all our gear in the truck and split the party. I went with Jaime, Ken, and Dick Pierce. We drove across broad fields of grain, past cotton gins and finally into the desert scrub. We stopped at one of the many drying ponds from the recent rain and found it crawling with ostracods and fairy shrimp. In the poolets, just about to disappear altogether, the movements of the numerous animals had deepened them, which probably inhibited drying. The little ostracods had their valves flowing with filamentous green algae. The biggest of them were maybe ¼ in. long. The fairy shrimp, looking like little Eurypterids, were larger—maybe 1½ in. long, including forked tail.

Soon we drove along Arroyo Soledad, an estuary from Magdalena Bay and soon over the flats we could see Lopez Mateos, its ironwoods, water tower, and galvanized cannery. Soon we could see Boca Soledad—a 300-yard stretch of water leading north three miles to the real sea entrance. The opposite bank was sculptured with 50-ft. dunes. Two boats rode at anchor in the windswept water. One was the *Louson*, our vessel. She is a beautiful little fishing craft—45 ft., 16 ft. beam, can haul 20 tons. She has a flying bridge you can enter from the cabin, 4 bunks, a beautiful metal swordfish plank, radar, the works. Soon we flagged the skipper Tim Houshar and went aboard. He's a good rugged fisherman, tough, bright. Dick and I complemented him on his trim ship. He was obviously pleased, I thought, as he was proud of her too. He had come over the bar at the Boca, following his skiff and in the trough had nearly rolled on his beam ends. There were breakers clear across. He told us about the *Martha Jane* that had caught Gigi, the previous gray whale that had lived at Sea World for a year. Mother had investigated the restrained baby and then come over to the boat and began to batter her. Three ribs were broken, the keel broken partly free before she gave up. I hope we find a more docile one and so does Tim. But, he has the guts to try and there can't be too many guys like that in San Pedro.

We unloaded food and gear, met with the local jefe (the head of the cannery). He checked out our papers and gave us the go-ahead, not cracking a smile about our strange mission. Speaking of such things, Jose Castello tells us that some people in his government think we are down here doing some military project relating to the Russians. He is supposed to be careful what he photographs so as not to get in trouble with the American Embassy. Hard to believe, I guess, that we're just interested in whales. Jose, a most affable young diver-biologist, is to take a movie of our attempt for Mexican TV. Jaime and Mano are just to observe us biologists. After some spaghetti (excellent) and

Pacifico beer we tried out the harness and went to bed in Ken Balcomb's house. There's no furniture but food boxes and cans made do and we sleep on the floor. He has three rooms and a leaky roof but its great for us. All we need.

January 27, 1973

Lopez Mateos, Baja California del Sur, Mexico

A lot to tell today. We caught a whale. We rose about 6:30, began breakfast and assembly of gear. Breakfast involved a bit of organization—finding things stowed in various cans and boxes. When done, however, it was great. Scrambled eggs and bacon, toast, coffee, and grapefruit. But it took time and we were late getting to the boat. However, gear gathered together, we were soon off down the channel toward the Devil's Bend, a winding channel that enters upper Magdalena Bay.

It was a beautiful morning, Vs of black brant flew by, a pair of white ibis stalked in the shallows near mangroves. Two sea lions appeared in the channel, one a lone female, and another with a gray whale.

Soon we encountered mother-young pairs of whales. Tim went to the end of the 35 ft. plank and readied his gear. We had agreed he would use a noose without a net in order to catch the animal by the tail, and then head net it later to fasten it fore and aft. He put one of his men, Randy or "R" who steered from the masthead. By hand signals and shouts Tim directed him over the whale pairs. Meanwhile the panga, a Boston whaler with a Mercury engine, criss-crossed over the animals. The rationale, which I think worked, was to frighten and distract the animals with two sources of fear to which they had to react. Thus they made mistakes and Tim could get his chance to noose them.

The pair we chased maneuvered away from us. The baby stuck very close to its mother—so close in fact that it sometimes rode up on the mother's flank as she turned and slid down over mother's side, actually in contact. The baby repeatedly changed sides seemingly taking "shelter" behind his mother's bulk. We pursued them rather rapidly—5-7 knots. Finally Tim got a shot as the whales evaded the panga. The baby came up a little behind where Tim stood so he reached back and placed the hoop over the baby's head as it rose to breathe. It was slow motion compared to a porpoise. Unlike the porpoise the little whale nearly stopped, dove, took out about 30 yards of line, and shook it off. Tim hadn't been able to get the noose over its pectorals. Baby and mother slid away to the south.

All around us, especially to the south were pairs of whales. Size of young was quite variable even though birthdates could not have been too far apart—instead it reflects the extremely rapid growth rate of these babies.

Ahead of us lay the sand-dune-lined channel on the ocean ridge while the inside is lined with low mangroves. Santa Margarita Island rises to the south, bluish gray, like the knuckled back of a sounding gray whale.

We came upon pair after pair and usually lost them because of confusion over which was the pair we were chasing and which was the old pair. Finally we turned up the Estero Soledad and Tim had a clear shot. All eyes were forward. In slow motion Tim placed the noose over the baby's head. This time it did not escape. The noose slipped back to the tail. We hauled the baby in, delaying the line on the foreward bit and finally, into the Estero, brought the baby and mother under the pulpit. Tim stood out in the basket with the colossal bulk of the mother crisscrossing under him, her 5½-6 ft. flukes breaking

the surface from time to time. She was patched with groups of salmon-colored whale lice and mottled with light-gray pattern marks. The baby was pulled aft enough that Tim was quickly able to drop the head net over her (she is a female) and we had lines fore and aft. This caused some interesting moments trying to keep them unsnarled and away from the mother. At first Tim tried to bring her alongside but the mother refused to leave and even aggressively slashed sideways with her tail and pressed against the baby. I suggested we take lines ashore and he agreed at once. We put one line in the skiff while the boat inched in close to the beach. With that line ashore and tended we brought the other in and shortly brought the baby into 3 ft. of water or so, too shallow for the mother. We tethered the animal fore and aft to mangroves and began to place the harness, which we did without significant trouble. Leaving three men to push her off we coiled and washed lines and put them in the skiff. The schedule went like this:

- 1245—netted baby
- 1325—harness in place
- 1342—mother left and went down the coast, close inshore
- 1347—baby pushed out into deeper water
- 1351—another mother and calf came close by
- 1400—baby picked up on receiver (28 microamp signal at about 300 yards)
- 1407—baby turned after long sortie into upper bay (turned by skiff) back toward main channel

Harness riding very well. No wrinkles or flutter, positioned well over pectorals. Antenna is out very well. In fact entire pack breaks water on each rise of the animal, antenna is out from 3-5 seconds or 1-3 signals on directionfinder, and down for 25-30 seconds.

1425—baby was cruising slowly and then began to rush toward the opposite side of the channel. About 300 yards away was the mother. She fluked twice and swam directly toward the baby.

1427—they met, mother slashed water with tail, circled baby and they went off together

It seemed as if an acoustic signal was the only possible way they could have contacted. On the beach the baby had phonated constantly, producing low resonant pulses a second or less long. The head[?] lateral and behind the head pulsed as sounds were being produced (no air was released during the sound).

The baby was heavily infested with lice of at least two types all in crevices or in patches. One I picked off was thumbnail sized. The baby was 16 ft. over the round (measured by knotted rope). She had 12-15 knuckles and they were sensitive to the touch.

For some time the harness rode nicely but then at—

1457—one limb of the harness broke free from lower plate and swung back, loosening the upper harness so it caught water. The reason was that the magnesium bolt was just too long to be taken up lightly thence the D-ring could be pulled free.

1500—Dick Pierce reports 10-30 microamps even with antenna slightly below water—when he could see yellow of harness. By the way the whale was named Carl which I painted on his float, but being a girl, it had to be Carla.

1605—Baby left mother and came to boat. I was in pulpit and saw her circle and purposefully go under boat, through, and rub against boat hull (which I could feel). She came up with the float broken half free and antenna snapped. No more signals.

As we passed the entrance of Estero Soledad the baby refused to go farther. The mother went on and returned later. This happened six times but the baby would never go farther. Finally, the mother returned and they went together up the Estero. We followed and lost them at dusk. Or rather we had to leave even though the harness had not released because of tide and shallow water.

The bolt was a five-hour one and we had waited 4:45. Maybe tomorrow we'll find the gear.

A few words about behavior. Once the baby was netted the mother ceaselessly tried to urge it forward, thrashed over the line, or used other maneuvers. She never attempted to attack the boat or strike at the pulpit though she often came close enough to do so. Her only attack was on the lines near the baby. Once she scraped under the lines and came up with a minor abrasion as a result, just anterior to the knuckles.

When the baby was ashore she tried to come to it, going into five ft. of water within a few yards of us. It was quite a sight to see 40 tons of whale nearly beached, head pointed toward you, within a few steps, and then watch her roll, throw a great flipper into the air and then slash sideways with the 6-7 ft. wide flukes while $\frac{3}{4}$ of her great, rounded body rolled above the water. Meanwhile our men worked with their backs toward her, putting the harness on. I was surprised to see her leave but perhaps, as Dick Pierce pointed out, the baby was phonating largely out of water and perhaps she could not hear her calf.

We ate a good lamb chop dinner and went to bed.

January 28, 1973

Lopez Mateos, Baja California del Sur

We'll try again today with another harness. Tim Houshan has rigged a fish-hook harpoon to place a yellow streamer on the mother. This will help him follow her and the baby when he is trying to net her. It helps greatly in following the animals to have a spot of yellow below the murky water. It's a beautiful brisk clear cloudless day, the water glassy except for current ripples. We rig gear and head south down the 1/3-mile-wide channel.

10:55—small baby netted 2 miles or so S. Lopez Matos. Tim missed one shot—slipped off snout. Baby rides in contact over mother's back, in contact with pectorals or flukes—like a remora almost. After rerigging Tim made another easy shot, this time from farther forward (animal ahead) and line slipped easily to flukes and held animal. Some time spent working baby toward shore. We put the head net over with no trouble other than the time the mother took to coming up under the line or thrashing at it with her flukes. Twice, at least, she came up under her baby, forcing it part way out of the water.

Soon we had the line tubs over the broad sandy shelf and not much later we had the baby over the sand in 3 ft. of water. As usual the mother patrolled in deeper water yards away.

Harness placement was quick and this time over the snout and soon it was bolted in place with a five-hour bolt and "Lee" painted on the side in honor of our accountant at UCSC, who we are sure would love to be here.

Times were:

1110—animal noosed

1123—team ashore hauling whale

1142—whale launched and quickly joined mother

1138—harness on and ready

The baby made no grunts so far as I could tell except during expiration. It was a male and had very evident fetal folds. It was 14 ft. long—straight line, snout to fluke notch. Grommet holes were 3 and 2 from bottom holes.

Jose, who had missed important shots, says he got the whole sequence on film and of course Tom, Ken, and others were shooting stills at a great rate. Jerry Koozman, who had just joined us, was delighted to see the whole operation. It went like clockwork. The flat weather, nice and sunny and warm makes it a pleasure just to be out on the boat, let alone catching and observing whales. As usual, everyone did his part. Jaime and Mario are proving to be excellent young workers, and I am impressed not only by how hard they work but about the very complete record of every thing we do they keep for their reports. Jaime helped a great deal with the head man at Lopez Mateos, translating and explaining for us. Jose Castello is a delightful guy, full of good humor and always busy with his work. He knows a lot and has worked with many of my colleagues.

1437-1444 (different watches)—harness cast off perfectly, floating perfectly upright in the calm water. It was transmitting nicely all the while. The lower limb already abraded through in one spot, probably from rubbing against mother's barnacles. The whale had also turned and rubbed upper right rear corner on mother as it was coated with what look like cyamid parts caught in the syntactic foam. Three of the handtight nuts that holds the lateral harness to the dorsal pack was a rear piece of syntactic foam our[?] radio housing was broken loose 5 x 5 in. [??] It's sure that some protection for harness from rubbing is needed. It's also doubtful, it seems to me, that the harness material will last very long. A good test and we learned a lot.

Much searching in the skiff failed to produce the harness from yesterday's whale, or the whale itself.

We turned for port because tonight we are invited to some sort of affair by the officials of the town.

Well, it turned out to be the neighbors who had quite a bash. It was in honor of the baby Jesus who had been born on the 25th and now was leaving the manger. Girls and young women mostly gathered around the kresch and chanted in response for a long time and then winding down sang songs about the posada. Then they took the baby, disappeared into another room, and came back with candles. One lady took the baby model and carried it to everyone to kiss. Then began dancing, food, punch, and lots of gaiety. The young bucks mostly stood in the street with their hands in their pockets, leaning on the hoods of cars but occasionally they joined in the dancing.

Note: the baby we caught today stayed almost where we caught it until the package came loose, as did yesterday's whale. Tomorrow we tag with a 24-hr. approx. bolt.

January 29, 1973

Lopez Mateos, Baja California del Sur, Mexico

Today we try for a 24-hr. track. The whale will be named "Baja" in honor of the Escuela Superior and Ken Balcomb will attempt to track it 24 hrs. with a skiff. Roger and Dick mouted a lifejacket light on the harness to help Ken locate the whale.

Everything has gone so smoothly that we could have done much more than we planned. Capture is easy, as is harness placement. However, we are delighted with what we have already learned and next time we will be able to plan for real whale biology studies, not just capture and harness testing.

Ken has found a whale he knows has been here for two weeks or so and which has stayed near the Shell Mounds 1 mile S. of Lopez Mateos. It's a slightly overcast but flat calm day so far and optimum for capture.

Well, we chased that whale for an hour and no dice. Then we switched whales and noosed one that Tim couldn't get the hoop over. The noose stuck ahead of the pectorals and wouldn't slide back. We had a helluva fight and finally Roger and I decided it would be too large for any of our harnesses so we got up as close as possible and cut the line. By this time the noose had slid forward ahead of the nostrils. I'm sure it will slide free soon.

Quite a few more fruitless chases were made with the whales simply refusing to get under the pulpit. The overcast prevented us seeing very far into the water, making following them underwater very difficult.

I'm beginning to believe there is such a thing as a nursery. All the calves near Lopez Mateos seem large. We have only encountered small young to the north near the big sandhill before Devil's Bend. Ken says some he has seen have spent two to three weeks in this area.

About at Big Estero S. of Lopez Mateos we caught a 17-ft. female. It was 1406 on line. Mother.

1426—skiff headed for beach with line

1430—landed and began to pull

1433—nearly in

1435—bolt in water, harness on

1441—started in launch

1442—launch

1445—came back in, mother with, went back out, launch complete

The mother was very solicitous of young, and angry, throughout capture and harnessing.

In the water she repeatedly came up under baby with her snout and once she poked at head net with her snout, pushing it about halfway off. The nets, by the way, are about two to three ft. too shallow for these large calves.

Once on beach mother came right in within a few ft. of us. I warned about her tail and almost no sooner than I spoke and she took a vicious pair of lateral slices at the nearest men, missing them a few feet but throwing a sheet of water over most of us.

The harness was quickly in place, four grommets from each side. It seems easy to bend the very flexible pectorals in these calves. I guess they are yet cartilagenous at this age.

The baby came back ashore twice and had to be relaunched. The last time Roger ended up much too close to momma for comfort as he pushed the baby out. Beyond the

call of duty for a pinnipedologist, as has been the case throughout the trip. He is a splendid field man.

We will take most of us back to Lopez Mateos and put Ken Balcomb on board with the radio. This harness has a light on it (glowing nicely at last sighting), and he should be able to keep track of it easily and get respiration rates.

Good day! The bolt is set for about 20 hrs. so it should come off tomorrow morning sometime. Jose says he got some great shots but did get salt water from the whale's tail in his camera. Even so he seems happy.

Not bad! For amateurs—three whales in three days and one let go on purpose. Now it will be hard for people to question that we can catch, harness, and track gray whales. I'm thinking about modification for the harnesses. For long times (two to three months or more) I'm wondering if metal mesh won't be required, or at least very stout coated fabric. I prefer mesh because it will allow water flow. Tom Dohl came up with the notion that an impact belt might work to compensate for growth. We need a tension device that will allow a slow expansion but stop the whale if he drags the harness against a rock. Since he will grow so much in a year we have to compensate for growth even on a traverse of a week. Otherwise we have to think in new terms.

I do not want to go to surgical techniques or to placement on the tail as was done with Gigi. Surgery is too messy and likely to be rejected. Placement on tail involves too much movement. Over the pectorals is best. It is the area that always breaks water, has least movement and the best natural means of fastenings (the pectorals). We just need to solve longterm expansion (growth), short term contraction (compression or diving), abrasion (from mother's barnacles and rocks on the bottom). We'll see.

Tonight chicken and some [?]-Pierce-Dohl spice special. Actually it turned out to be chicken in red wine. A couple of onions chopped fine with two or three cloves of garlic, browned in bacon fat, from bacon just fried, chopped fine, brown chicken parts and set aside, lightly sprinkled with flour. Then with a stew pot add two thirds beef boullion and 1/3 red burgundy to cover. A couple of bay leaves per chicken and thyme, salt, pepper. Simmer 30 minutes and EAT!! Eat we did, with a good salad and chocolate pudding which I made and succeeded in splattering on the wall. Man, it's hard to pour.

After dinner we wandered in the cool darkness checking out Lopez Mateos. It's a factory town. Most everyone works for the cannery—except the local merchants. Most houses are neat plywoods, paper thin with corrugated roofs. Some have bothered to use tar paper. Casuarina trees are the main shade over dirt streets that ultimately wander off into the desert. Everyone is well-fed looking and there are very few old people, though there are rafts of kids of all sizes. There are a couple of cantinas blaring their requisite quota of mariachi music into the starry night. We bought a couple of coffee mugs, looked at the meager merchandise, and finally wandered home to sleep.

January 30, 1973

Lopez Mateos, Baja California del Sur, Mexico

Pancakes for breakfast! Then we went down to the muelle to wait for the *Lousan*. We watched a load of thread fin herring and occasional sardines being unloaded by vacuum pump. Twice now the seiners have come in with holds full and a deck load.

Soon we were on board and found that Baja, the last whale, had stayed almost in place all night. The transmitter worked for a while and then quit and the little light shut

itself off after a while. It was loose enough that it worked up and down and pushed the switch. So our redundant systems both failed and they had to follow the animal, which proved simple. During the night the animals moved rather little though pods did pass them going into the estero. One pair passed right under the pulpit, outlined in phosphorescence.

The harness was recovered easily in the morning, within 50 yards of the boat. Take that, you astronauts!!

It was floating idly in the water with antenna vertical, except the radio wasn't working and the light was off. Anyway, "Baja" is back on board. There was very little abrasion. Only a little on the anterior edge of the belly straps.

In the evening Dick said the baby had been thrashing around rather strongly, coming part way out of water and rolling. But later she calmed and no further unusual activity was noted.

Well, we've gone north toward the Boca Soledad and will turn and make a count back south of whales in the channel down to Devil's Bend.

Ken Balcomb, Tom, and I kept counts on marine mammals, separately. We cruised from the Boca to the head of Devil's End, under overcast skies, not the best observation conditions as you can't see down into the water easily.

The harness was sighted by Ken in the eel gras S. of the Sand Hill "Colina Coyote." It was retrieved quickly and we found that the float had been broken away at the grommets and was rubbed with blue bottom paint, as was part of the harness. Thus when the calf rubbed the bottom she probably rubbed the harness hard enough to pull the D-ring over the belly pin and release it. Otherwise she couldn't have gotten blue paint inside it. The harness was nowhere badly abraded even though it presumably stayed on the animal for several hours. The block of syntactic foam was badly cracked and laid back and the antenna was snapped off flush with the housing. Bob Gibson got no signal when he pointed the receiver at it.

We explored the upper Devil's Bend a bit, following the oil drum channel marks. We could see the shallows close in, brown beneath the green water. Finally, rounding a bend in the channel the *Louson* ran aground and had to back off.

We turned and headed back to Lopez Mateos. Mario, Jaime, and Jose put together a really delicious taco and bean spread. They sprinkled oregano on the pinto beans and put cilantro in the sauce. Great!

Tomorrow we hike beaches north of Boca Soledad.

It was overcast, blustery, and cool today, and the wind blows in the ironwoods outside our house. Hope it calms for tomorrow, though overcast will make it easier hiking.

January 31, 1973

Lopez Mateos, Baja California del Sur, Mexico

This morning we headed north on the *Louson* toward Boca Soledad. We will hike about eight to ten miles of beach, looking for strandings. Ken Balcomb will stay on board and observe.

As we neared the Boca, a few open patches of blue showed through the otherwise glowering, misty sky. Later it cleared altogether and became calm and beautiful.

Tim was able to thread the channels for five to six miles up the water way above the boca. Hundreds and hundreds of black brants rose from the water all along the way, crisscrossing in front of us. Many other waterbirds such as kingfishers, egrets, herons, terns, and pelicans rose around us, alighting on sand bars amid the mangroves. Finally he could go no farther. We clambered into the whaler and wound our way about to the open water area where the chart says "Tides meet." We nosed up to a sand bar that was absolutely covered shoulder-to-shoulder with shorebirds—godwits, willets, and some lesser birds that may have been plovers. The pack moved nervously away from us, finally rising in a rush of wings—red, black, and white and tan flashes as they wheeled and swooped down to rest on a more distant bar.

A short hike over the hummocky four-o'clock covered dunes brought us to the ocean beach. Tiered breakers lined the flat shore. At high tide they eroded the base of beach dunes and flooded between them carrying flotsam and shells far into the dunes. There were six of us hiking, a couple of packs with food and water and a couple of knapsacks for beach finds.

I spent most of my time plodding in the reentrant canyons into the dunes. Everyone "did his own thing," as the saying goes. Some by the water, some looking for shells, or watching birds. There were enough mammals to see, sea lion skulls, very long snouted *Delphinus*, a couple of small gray whales and one 35-40 footer. The beach was paved with shells—cockles, big clams, big enough for soup bowls, little delicate shells with two rows of long spines. One interesting and perplexing thing. The beach was strewn with green turtles that had died ashore at different times. I counted 26 in the 8 miles. There was no evidence of injury to any of them and some were much longer dead than others—a mystery. All had barnacles on them, some very dense, and some barnacles quite large (50 cent piece approximately).

It was a nice long walk and I was tired when we reached the Boca. We sat on the beach watching the whales and bottlenose porpoises swimming along. I think I saw nursing and saw quite a lot of behavior in which the baby lies at right angles to the mother's head, and crosses back and forth over her. What was going on was not clear.

Ken had watched a mating and had recorded patterns from many whales. Tomorrow we set up an . . .

February 1, 1973

Lopez Mateos, Baja California del Sur, Mexico

Today we cruise down to the nursery area just north of Colina Coyota (Sand Hill) and anchor. We have seen as many as 20 whales in this broad bay and we hope to have some of them come near enough to the quiet boat to observe behavior between mother and young. If it works Ken may go to a tower installation later. Those who wish can go ashore to walk and observe birds. I think I'll stay on board to observe. Then in late afternoon we will return to pack up gear to go on board the *Louson*. It's a bright sunny day, calm, with thin cirrus clouds over part of the sky.

Tonight we have a fiesta for everyone including the crew (good fiesta it was, too).

February 2, 1973

Lopez Mateos, Baja California del Sur, Mexico

Long before there was light we were up rummaging around to get our crew over to the local bus stop by 5:30 for the trip to Ciudad Constitucion.

We made it in time and Ken, Jose, and I stayed behind to pack all gear for the trip to La Paz. Especially we had to pack all the skulls Ken had picked up to take to the Instituto de Pesca for shipment to Museo Nacional. They had become a cause celebre in the last couple of days. I had told Ken before the trip that if he planned to violate any rules his operation and mine would have to be separate. He had ridden and walked 200 miles of beach and had collected what could be some real rarities—the pygmy sperm whale skulls, a *Lagenorhynchus* south of its supposed range, and what is probably an elephant seal from the Gulf of California. He planned to take them across the border.

It became slowly apparent that Jaime is a very nationalistic and probably bitter young man about Americans. He has been refused permission by some U.S. officials to take mud samples in San Diego harbor and he was resentful. Also he was a self-appointed watch-dog type who had tried to get appointed a sort of deputy to check on people who collected specimens and hunted in Mexico. Permission was refused but the attitude remained. He was miffed at us too, I began to learn, because of the slowness of our correspondence (it came at the Christmas rush) and because at first we said we wouldn't pay his and Mario's way (we didn't have the money). Finally I invited him even though a supplement we sought hadn't come in. It did, the day before we left. Well anyway, we found Jaime trying to get copies of our permits, we found him questioning the disposition of skulls, and insisting on reporting a scratch on the back of a mother whale we had produced when she ran under the taut line to her baby. Fortunately no major injuries or mishaps occurred and if he wishes to put us in a bad light it will be a concoction of his.

I was justifiably nervous about all this as we want our relations with Mexico to be good. Using Jose as an informal intermediary I was able to clear the air a little. I talked to Ken and told him we had to turn in his skeletal material and that the best he could hope for would be a chance to study the rare specimens before they went off to Mexico City. He agreed well enough though wanted to be sure the material was't simply discarded. That I could understand. Anyway we packed up his precious bones, some mere blobs of liquid carrion.

On the bus poor Tom came down with the eephus (ancillary dysentery) and when we met them in Villa Constitucion he was green and doubled up like a dying stork. I got him to lie down on the sleeping bags in Ken's truck and bought some elixir of Lomotil and Neomycin and dosed him well. The stuff is full of atropine and chloral hydrate and acts with remarkable speed. He soon went to sleep and by the time we had reached La Paz his color was back and even though shaky, he could navigate.

I looked up the Pesca office and met a young biologist, Sr. Olquin there. He arranged to have the skulls cleaned and I paid for shipment to Mexico City (Olquin had no budget). Olquin wrote a letter letting Ken take the rarities to USA for study, to be returned to the Museo later. A good solution, I thought. Later I found Jaime had been around to check up on us. We finally won him around, I think, as he was very friendly the last day, perhaps because I told Jose about my activities in trying to get scholarships for young Mexican-Americans in East Los Angeles. Who knows? We'll see.

We had a victory dinner at the marisco restaurant. Lobster, white wine (chenin blanc from Santo Tomas vineyard south of Ensenada), marisco chowder etc. Very good! In fact the soup was certainly one of the best I have ever had!

Tom was positively chipper when we got back.

February 3, 1973

Home

Goodbyes, packing, customs, airplanes that were late, close connections, notebooks (this one) left on the airport tram, and retrieved just in time. Rain in L.A. and so Phylly tells me, at home. A splendid trip. Great to do some field work and learn to know Dick Pierce, Roger Genty, Gerry Koozman, and Bob Gibson under field conditions. They were great company, amusing, hard working, and interesting. I enjoyed Jose a great deal and aside from the stress of the last few days, the boys. And too, we accomplished our mission to a degree quite beyond my best hopes.

Granite Mts., San Bernardino Co., California, April 6-7, 1973 (class)

April 6, 1973

Granite Mountains, San Bernardino County, California

Off with the walking class. There are 30 of us traveling in a bus (20 people), a van (8), and my pick up (3).

We met at 11 PM Thursday, loaded without too much fuss, and shoved off. There were three meeting points along the way and we found that even the bus moved along quite well. Breakfast at the old White's Cafe in Mojave after a very rapid trip down Hwy 5 on the west San Joaquin Valley. Then off past Edwards Airforce base to Barstow, to Amboy and up to the BC. The new freeway past the Granites is almost open and though hated by me will bring us within 5 miles or so.

The winter rains had lighted the desert. Near Mojave desert gold formed carpets of yellow. A blue *Phacelia* patched it with blue. The desert is dimly building up. There seemed some kind of installation all the way to Barstow.

At the BC we drove straight to the cabin, unloaded, and there prepared for a hike. The weather was mild and the skies clear. It's not warm enough to urge most lizards out, but very nearly so. *Uta* and *Sceloporus* are evident.

I took the class to the Cottonwood Springs area for a walk around the spur in the Granite Pass and back to the cabin. We botanized along the way, some collected insects, some pounded orthoclase crystals out of the rocks. Todd and Ginger Keeler-Wolf who really know their plants helped me with the animals. Todd is one of those folk who identify birds by call and he ran up a modest list that most of us didn't see.

Several *phacelias*, a rock cress (*Arabis*), *Rumex*, a *Zygadenus* with green flowers, a *Phlox* evening snow, a *Salvia* (*mohavensis*), desert five-spot (*Malvastrum*), at Pisgah[?]. One of the most common was yellow throats, a blue *Phacelia* with a bright yellow throat.

As for birds we saw a ruby-crowned kinglet, black-throated sparrow, fox sparrow, Oregon juncos, robin, white-throated swift, Cooper's hawk, great horned owl, great catcher, lesser goldfinch.

The hike covered about 3½ fairly easy miles but everyone was ready for dinner when we arrived at camp. Miraculously no one failed to show up, though I had a tough

time getting them going at first. It's a good group and I don't think I have an eskimo interpretive dancer among them. A little guitar music, a bit of watching red-spotted toads (calling, amplexing) and to bed.

April 7, 1973

Granite Mts., San Bernardino, California

Today is observation day. I think it is a success. We had reports in the morning. I told the class the history of desert floras and climates—Madrotertiary and Arctotertiary flux, the pluvial events, etc. Ken and Maggie Asplund, who had driven up yesterday afternoon talked about water and temperature problems and then we had some reports from the class—geology, etc. It went well with winds whipping over the deck and threatening to push us off periodically.

After that and a little lunch we pretty much did individual things. Some hiked the rocks behind, others headed out onto the flats to look for birds, one group went to look at stalagmites at Mitchell's Cavern. I hiked slowly down the arroyo below the tanque. The air was brisk and the bushes were full of birds, in the squaw bushes and cat's claws. I followed a thrush up and down the creek. He rested on the sand—long slim legs, rusty buff tail, breast speckled with round spots. It had to be a hermit thrush, but that seemed way out of place. The more I looked the more it had to be. My last look convinced me more. Well, I don't know. I saw a lot more—Audubon's warbler, gnatcatchers, rusty sided towhees—one old male with a bright red eye.

I carried a load of cat's claw wood back for the evening fire. The blustery desert wind kicked up dust and gravel around me and down in the valley a dust pall swept the playa. It was too cold for most animals to be out, I knew, but we packed up a car to go night driving down by the vulcan mine road. Too cold though. Not a bug walked the asphalt. Back at camp a magnificent spaghetti awaited us, with French bread and salad. I'd picked up some beer and then we had reports from the archaeologists—it wasn't much science but we had a helluva good time. Might have even learned a thing or two. After that the guitars and harmonicas came out and the old Bunny Club rocked with a lot of blues—the dishes got washed and I sat up on the bunny rock and wrote notes, hence the disjointed nature of all this. Hard to discuss hermit thrushes with the good music rolling out.

Point Reyes, Marin Co., California, April 21-1973 (class)

April 21, 1973

Pt. Reyes (Laguna Ranch), Marin County, California

The natural history class and I have spent a fine day (yesterday) hiking in over the Inverness Ridge and down to Laguna Ranch which is now a youth hostel. This morning most of us walked down to the tidepools SE of Linantour Estero and have now come back for lunch. I'm finished and have decided to spend the afternoon in observation. Being a little weary I won't go far but intend to wander down by the creek. We are a bit over a mile above the sea here, up a broad grassy bottomed canyon. The hostel sits on the canyon slope overlooking the alder-lined . . .

The rounded hills on either side are punctuated with palisades of gray sandstone, usually topped with Bishop pines and stunted, wind-pruned Douglas-fir. Over the slopes is coastal meadowland vegetation—grasses, blue-eyed grass, plantains, some poison oak, clumps of *Baccharis* (coyote brush), thistles, and various other herbs. The moister spots are grown with clumps of *Juncus* rushes, Douglas iris, and berries like salmonberry, strawberry, and blackberry.

I'm sitting now in the warm afternoon sun alongside a quiet stagnant pond next to the creek. It's 50 yards long and a third as wide. It's choked with *Nitella*? except for meandering channels of greenish water and patches of a reddish buff colored floating plant. Much of the surface is covered with tracts of tan which turn out to be a tiny four-leaved plant with long hairy depending roots (*Lemma*?). The reddish plant is more complicated, having a flat branching pair of leaves also with long trailing roots. It ranges from green to wine-colored.

Around the pond edge is a band of arrow-shaped *Rumex* leaves and wild celery. Above, on the muddy banks *Juncus* . . . The pond hummed dreamily in the heat—blue-bottle flies flitting over its surface and butterflies flitting erratically amongst the bordering bushes. As in all observation, if it proves uncomfortable the pastoral scene is instantly submerged in the human penchant for movement. I was hot, some flies insisted on sitting on me, so I left.

I rose and walked toward the alders whose tops rose in a meandering line above the creek.

To get to the creek one had to beat through shoulder-high cow parsnips, willows, and berry vines. Down a cut bank of stream cobbles and gravel I went until I came to a wooden bridge that led to a cobble bar around which the gentle stream flowed. Red alders sprang from the bar, making mottled shade against the still hot sun. Nettles lashed my arm as I passed, leaving a sting that kept on for an hour or more. I dug a seat in the cut bank, took off my shoes to rest my hot feet. Socks rinsed and hung out to dry I rested [?] a downstream rim of stream, the old multibranched skeleton of an alder and banks tiered with green herbage. Ranks of nettles stood on the slope. A man-i-in-the-ground vine sent tendrils up a fallen branch to an alder and a salmonberry plant dripped over the stream, its berries yet pale and unripe.

Behind me the stream bubbled over cobbles making its lulling burble. Perhaps four inches deep the stream hurries, its cobbly bottom brown with diatom scum. Little rafts of bubbles beat by the rapids bob and duck in the ripples as they hurry past me and around the bend. Two fuse in an eddy under the big fallen alder log.

I am visited warily by birds. A robin thumps onto the bridge, sees me and jumps into flight upstream out of view. Another hops out of the undergrowth onto the cobble bar to drink, not noticing me. A bright yellow piliolated warbler skitters his nervous way across the brush of the dead alder. I'm not sure if his nervousness is due to me or is inborn. I've never seen a phlegmatic warbler of my [?]. The mosquitos notice me though and one tries to plumb the swelled vessels on my foot. I swat in the midst of lowering his drill rig. Mostly the animal life seems to be insects and spiders.

Striders skating on quiet eddies, their feet dimpling into the surface tension, shining threads of spider silk gleam in the glancing sun.

Squeaking produces some curious streamside dwellers. A plump sparrow with a speckled breast and a dark apron of brown hops onto a pencil thick branch an arm's length away, hopping and peering inquisitively at me—a chipping sparrow, I think.

He utters a single note that I can imagine says “chip.” Anyway he came to my squeak and went away disappointed in what he found.

I grow drowsy in the warmth and meanwhile the wind breathes on the tree tops overhead but it does not stir the air near me. The buzz of flies over the stream . . . I slip down farther on the cow parsnip leaves that line my seat to keep me dry. A snooze listening to sounds of stream, flies, and wind. Then warmth and sleep. Brief I think though as I wake to the chirr of a wrenit. The sun has left me and the damp sand chills me. Above in a shaft of light amongst the branches of the old alder gnats swarm. Why? They circle madly out of touch with all but the insect pace of this place. It isn't a random dance but a rapid purposeful circling. It soon takes them out of behind the nettles. Are they warming? I suspect so. Other great clouds are more random but all seem related to sunlight even though their members swing off into shadow from time to time. Bigger insects seem more obviously purposeful though some dance as they fly, like wasps who constantly dip their tails as they fly along.

The winds increase. They lift and heave the willows on the bank above. Broad nettle leaves stir and I am getting cold in the shadow. I made such a lump of obvious protein here on this creek bed that I'm out of scale in a mostly plant world. Those creatures that can know are frightened by me and leave. Too much animal for too little a creek I guess. I'd have done better to hide myself.

Back at the hostel a work party had cleaned up.

Bluff Camp, Carmel River, California, October 20-21, 1973 (class)

October 20, 1973

Bluff Camp, Carmel River, Monterey County, California

We left at about noon from UC Santa Cruz, amid reports of imminent rain. We drove up the Carmel Valley to the Hasting's Reserve where John Davis, the director, was waiting and gave us advice on a camp. He said since we wanted to do some riparian work he thought Bluff Camp was best. It is on the Carmel River just above Los Padres Dam, which I am told supplies much of the water for Carmel Valley. Since it was then past 4 PM we left quickly, backtracked, took the Tassajara Road, and wound around until we came to Prince's Camp, a hodgepodge of old trailers and junk.

We assembled packs and were soon off up a trail toward the dam. It's mixed chaparral-covered hillsides, with a nice oak-madrone, sycamore, white alder, willow streambottom. The stream is fairly large and tumbles over smooth gneiss and granite boulders to the dam. The lake behind the dam was very low and much mud was exposed along with dead trees. The trail skirted the dam to the west on a nice leaf-covered trail amid big-leaf maple just turning yellow, stands of poison oak in various shades of pink, red, white, and yellow. The forest is much drier than that at Santa Cruz. Chamise forms patches of dark brown on the hillside from the dead flower panicles. Oaks are in the moister locations with madrones even more restricted, moisture-wise.

Finally we left the dam area and headed for the camp. It was very dark by the time we slid down the talus-covered trail into a fine oak grove with plenty of room for all of us.

Hal, who had gone fishing, came in later. Sharon and Val were our chefs and prepared an incredible vegetable-based bouillabaise over oxtail soup. Hal flung in a handful of venison chunks, which we sought for like they were gold nuggets. Conversation, to the sack with sparkling stars overhead instead of rain. I picked a madrone to sleep under which pelted me with berries all night.

The class has divided up into groups, each with a project which we hope to compare with similar attempts on Santa Cruz Island. One group is looking at niche width in caddis flies. Another is looking at species diversity and distribution in oak woodland and chaparral. Another one is doing species diversity in the stream bottom, and the last group is looking at dispersal mechanisms in seeds. We hope that some of these things will reflect back on insularity.

It's Hollywood and Vine up here—troops of scouts, families, classes, etc. troop by. It's a three-day weekend, and even with a chance of rain, everyone's in the woods. I visited Dave Hart and his group who were looking at caddis fly larvae. They had found some net spinners and were trying to determine niche width. They had devised a whole series of tests for water velocity using ink blobs in the current. The larva had built a little wall around a leaf underneath against a stone with the web stretched out in a place where the current tumbled in a shallow stream between rocks. Between 1-2 ft./sec. and less than 8 in. deep. I wonder if leaf placement is done so as to funnel water into the net, and hence to increase food supply. At any rate Dave and his team—Val and Sharon—seemed to be full of enthusiasm about paddling about in the water and were making excited happy rounds when I left.

Downstream a bit was Rob Bosworth, Lambert Woo, Kathy Johnston, and Hal Thompson. They were sitting on the bank looking perplexed. Their task was to make a bottom fauna population transect of the insects, larvae, etc. There were so many they didn't think they could count everything. I agreed and suggested selecting stones every two or three feet and running transects. They went to work at once and soon were gaining an idea of bottom distribution. Lo and behold almost no life was on the bottom in the still pools—only in riffles and shallow places. Why? Anaerobic on the bottom? Not enough current to transport and trap food? Light? Competition with bacteria? They didn't find out but they did learn that there was a problem.

The plant diversity—oak woodland-chaparral group worked away just up the hill. They'd laid out a 100-ft. quadrant and were puzzling over some mysterious plants. One, I suspect was a broom that lacked flowers and was just stalk—pretty hard to key out. They'd cornered a group of ladybird beetles—swarming in a bush and were wondering what caused the swarm. The ladybirds were heavily spotted and quite variable within the group in this regard. I saw some mating, I think.

We found a red trumpet-like flower and had been arguing over what it might be. Dave said it was a fuchsia. I scoffed! Craig said it should be with Onagraceae because it had a typical onagraceous inferior ovary. Onagraceae, I scoffed! It turned out to be "the California Fuchsia" and a not a true fuchsia but in the Onagraceae. Chalk up two for the younger generation! Well, I'm a porpoise watcher anyhow.

They went off (Ben, Peggy L., Craig, Dena, and Frances Thompson, who hiked up to join us) to make some transects through the chaparral.

The seed dispersal people were off somewhere (Nancy Dockey, Peggy [?], Irene McGinty) and we didn't see them until dark.

So, I hooked up my fishing pole and started upstream to catch a little dinner. It's a lovely canyon with tumbling water, smooth granite boulders, broad gravely reaches, coming now and again against steep rocky faces. Usually there I found still deep pools all leaf-floored and brown that must be scoured clean when the freshets come. Alders and sycamores are the main cover and make a patchy light and shade. I caught nine plump little rainbows and wandered back before dusk.

A nice campfire with good reports all around, some good round and other singing and then off to bed, still under sparkling stars instead of rain.

October 21, 1973

Bluff Camp, Carmel River, Monterey County, California

We'd collected a lot of interesting things and so this morning was given over to writing, and identifying. Someone brought in some galls. These are fantastically varied and specific for different insects. How the insect commands the plant to build these and what the function of the various kinds could be I don't know. I cut one open and a little group of gall wasps lay inside an almost shelled capsule. The little wasps had wings folded and shiny and were covered with granular material like sugar.

Another interesting thing we saw was the water penny—a tiny creature (1/4 in. long) that clings to rocks and has a jointed back that looks for all the world like that of a chiton. It was fringed all around with hairs. Underneath was an insect with six legs, two little tentacles, a pair of little black eyes, and fringed pleropods astern round back and forth like oars in a slave galley. The we learned that it is a larva—and of a terrestrial beetle at that! So complete and so well adapted as a larva—why change and go through all the hassle of metamorphosis? It too must be part of the scheme—a resting period, a way of lasting over some inhospitable time. I don't know, but to sit in this single camp and see the life around us is enough. There's plenty here for a lifetime of wonder.

We straggled off down the canyon, and I waited for the chaparral types to come back.

October 22, 1973

Next day a nice hike down to the canyon—sat in the creek with Frances Thompson and then home. My feet hurt.

Santa Cruz Island, Santa Barbara Co., California, Dec. 10-15, 1973 (class)

December 10, 1973

Santa Cruz Island, Santa Barbara County, California

Here we are at the Santa Cruz Island Field Station after a good spaghetti dinner and a couple of ping pong games.

We started at 6 PM last evening in the blue bus, Craig driving. He is a jewel behind the wheel and we all felt very safe. Much conversation, fritos, a little wine, other

goodies, and before we knew it we were traveling through Santa Barbara. After some fiddling around we located McGrath State Park south of Ventura, where we could throw out sleeping bags. The place was alive with rabbits to the point that I wondered if we would be trampled—both jacks and brush bunnies. I had a good night's sleep except that the alarm I brought didn't work and fortuitously I awoke at about 3 AM, borrowed Dave Hart's watch and got us all up at 6:15 AM, more or less on time. At the Navy base we located the RV that would take us out to the island and met Irene McGinty up from LA seeing her anamorata—a labor organizer. Rob and Peggy also drove in. Shortly we were off on a flat calm day toward the island that rose along a long stretch of horizon. Our course took us north of Anacapa at 18 knots. Murres, kittiwakes, gulls, and shearwaters were seen as well as three schools of Dall porpoises and one big gray whale going southeast about five miles offshore.

The vessel swung into Prisoner's Harbor (named for prisoner's set loose by Mexicans). The little dock was lined with people from the navy and ranch and Lyndal Laughran the station manager.

We loaded all our gear and food (a lot because it was mostly vegetables) in a truck and headed for the station up in the central valley. The station is a nice couple of low buildings—bunk rooms, shower rooms, volley ball court under the big *Eucalyptus*.

We had a rousing volleyball game and then drove down to Prisoner's to catch the low tide at 5 PM. Everyone was a bit lethargic from lack of sleep but we enjoyed seeing the large array of animals and plants there. The abalones—reds and blacks at least, were above tide line in numbers. Many interesting invertebrates, such as *Pagurus*, hermit crabs, porcelain crabs, nudibranchs, keyhole limpets, and sea squirts. I was surprised at the number of cling fish (*Sisyogaster*). In general we saw a lot. I found one of those little intertidal mites, bright red, and almost as small as a grain of pepper, scooting on the surface film. By letting the reflection of sky glance off the pool surface, one could see him slightly dimple the surface. It never went through though, and finally left the water, running up the rocky pool edge.

On the way back we looked at some of the plants. The cliff edges were lined with a tree-like (that is, the form was like a tree) composite (*Coreopsis gigantea*). It had a trunk and a plume-like crown. *Marah*, the man-in-the-ground, was coming out, its new shoots searching among the downed branches of the live oaks. The toyon was heavy with berries—puckered the mouth they did. I was interested in the live oaks. They are really very distinct from those at Santa Cruz. The bark here is very smooth, unfissured and light gray. In Santa Cruz it is fissured and the trees of different growth form. The latter is not so clear as the bark characteristics.

A good dinner and ping pong, looking at specimens, and to bed. Brisk here. I'd guess low 40s.

December 11, 1973

Santa Cruz Island, Santa Barbara County, California

Today we divided into two groups—one heading for the west end and the other hiking down from the main S. ridge to Willows Anchorage. I went in the latter group. We were dropped by jeep at the crest of the ridge, about three miles up a rough dirt road from camp. As the cars left us we surveyed the trail ahead of us. We stood on a long E-W ridge, the central valley behind us, looking south over canyons and rough mountains to

the sea. The slopes around us were grassy or sparsely covered with gnarled toyon or scrub oak. The latter is huge—a real junior-sized tree, often 25 ft. high. Clumps of large-leaf buckwheats (an endemic and one from Santa Catalina Island) were scattered amid the grass. We descended down a rutted road gullied into the red schist—the oldest rock on the island. Down and down we went into a grassy canyon bottom. Just as we entered the wash we came upon one of the largest cherry trees on the island, a great old giant of several fused trunks, perhaps 50 ft. high. I was surprised by the size of the leaves—very large and broad—maybe twice the area of the leaves of the Catalina cherry. The trail turned down the stream bottom in a corridor of mule fat (*Baccharis viminea*), a favorite of mine. It reminds me of stream bottom hikes in the early day with its pungent pleasant odor permeating the moist air. To come back from a hike covered with its essence was always a pleasure I consciously enjoyed, though my mother sometimes complained of my smelling like “brush.” The toyons were bright with unusually large red berries, and Craig Matkin and I hassled over a big shrub—20 ft. tall—deciding it was a mountain mahogany (*Cercocarpus* sp.) of enormous size with very large leaves. Most plants here seem to have large leaves and often growth forms larger than on the mainland.

Further down the creek bed water began to dampen the sand and finally to rise into a small hurrying stream a couple of ft. wide. Its bottom stones were brown with algae and dark leaves trapped when the water washed them against small snags. We turned stones and Peggy Ledyard and Rob Bosworth came up with stonefly and caddis fly larvae. I added some more including one ½ in. monster with bulging eyes who slapped his triffid tail at my finger. Rob and Peggy, Sharon and I keyed birds, puzzling for a long time over a flock of sparrows—the adults were easy—golden-crowned and white-crowned sparrows. Finally we decided our puzzlers were winter juvenile plumage of the golden-crowned.

At the beach we caught the others—they resting a nibbling lunch, hunkered in the sand. It is a beautiful cove—palisaded cliffs on both sides and two small cliffed islands off the east limb of the bay. On the ridges the peculiar *Coreopsis* grew almost like dwarf palm trees, lining the skyline.

Back of the beach was a big shell midden—black soil filled with cracked shells, barnacles, limpets, abalones (all blacks), sheephead jaws, and mammal bones. I dug up a more or less complete sheep and then realized that two cabins had once stood on the mound, marked now by a few boards.

A short jaunt around the bluffs and we came upon a wavecut terrace covered with a tracery of pools, beyond arching pocket beaches at the base of tall bluffs in the tuff deposits. One big slumping landslide dropped onto the bench. The calm sea lapped in 2-ft. waves at the rocky edge, retreating to a lowtide sometime after sunset. We poked in the pools briefly and began the long trek back. At a water gap where the *Baccharis* formed dense clumps and where willows crowd to the water's edge, I heard *Hyla regilla* calling. Later near the Cheney fossil plant locality in Canada Sausa, I caught a tiny brown *Hyla*. Anyway, not long after we spied a cave up the hillside in the tuff, hiked to it, and sat hunched looking out its low entrance at the valley below.

The bench at the mouth looked to me as if it had been flattened by man by pounding. In fact I could see a line across the face of the rough floor where chipping seemed evident. Back deep in the cave the roof was brown, especially on the protruding

rocks, and I assumed this was from the wool of sheep, such as we had seen and heard on the canyon sides—long tailed animals that scrambled the hills.

Why do these caves form? Their floors are covered with dust. They are often hundreds of feet above the sea, too high I think for even sea level lowering to account for them. I suspect since the rock is clastic, with considerable pebbles, that water erosion is important, taking away the fine cementing materials. Later, when the depression is deeper perhaps condensed fog or seepage loosens the largest pieces, causing them to fall free and causing the fine dust layer to build up. Wind may clean this out from time to time, or even animals may track it out. In ours not one larger pebble was to be found in the dust and I suspect it came from man picking sharp pebbles from beneath his or her bare posterior and flinging them out the entrance.

Down an adjacent tributary rill we came upon a small grove of Santa Cruz ironwood (*Lyonothamnus floribunda*). These are rather straight-trunked shaggy barked trees with peculiar long leaves arranged palmately with incised borders. I tried to make a walking stick out of a dead branch. Wow, the wood was heavy, so heavy in fact that I abandoned the effort.

On up the creek bed I began to feel my injured foot coming back and so I slowed down and lagged behind, cutting a nice willow walking stick. Much cackling and chortling from our jolly crew came from up ahead, especially when I came upon a dense bush and found two of them crouching under it (Irene and Peggy L.), looking for bugs or something. I made a smart remark to the effect, “You look like you’re going to the bathroom”—followed by much additional chortling—they were.

The hill was steep but we were soon on the ridge looking back down our canyon, now deep in the gauzy spread of darkness. A soft cloudbank, like gray wool, rolled over valleys and hills to the west. Devil’s Peak was crowned with fog and the sun was just above, ready to plunge. We turned our backs to her, facing the east down our ridge trail. At the next ridge we faced back and watched the sunset—the cirrus turned pink and we watched the flush spread over the north ridge to our left.

Long before we reached camp it was dark. A piglet sniffed and crashed ahead of me. Nancy Dockery took up station behind me, saying she wanted the quiet for walking, but I wonder if she wasn’t watching me as I hobbled along.

In the warmth of the station we began dinner. Half an hour later the west-end crew came in, all full of tales. Dinner, conversation, notes, and bed. This central valley is really brisk this time of year. Steaming breath and probably around 40 degrees F. A little lame fox lives under the house. He came out, holding up his front paw, to take bits of bread and cheese from us, coming within a foot or so of our hands. These little fellows are patterned like the mainland gray foxes, but are much smaller and juvenilized—short faces like little kits, wide set eyes, and big furry ears. Lyndal is studying them. My foot is pretty stiff. I hope it goes away.

December 12, 1973

Santa Cruz Island, Santa Barbara Co., California

Reverse the order today. Our group to the west end and the others to Willows. We loaded a little faster than yesterday. Lyndal drove the lead vehicle while I took the rear jeep. Up the valley we went, past fenced fields above which groups of sheep stood—on their barren land that extends to the highest northern peaks, with green grass inches away.

A lamb had gotten through the fence and tried frantically to join its adults who ran up the hill.

As we traversed the valley to the west we looked at the oaks—big *Quercus agrifolia* in the stream bottoms and then some hybrids called *Q. mcdonaldi*—a mixture of *Q. lobata*, *Q. dumosa*, and *Q. douglasii*. Only *dumosa* is now on the island, yet even to me the effects of the others are evident—the rugose bark and something of the growth form of *douglasii*, and the leaves of *lobata*. The same oaks have been hard hit by the oak moth but were coming back—green leaves sprouting at the branch tips. *Q. tomentella*, an ovate-leaved species with pubescent branchlets and leaf undersides. Glossy, deeply veined leaves very dense over the crown.

Shortly we came into the great grove of Santa Cruz Island pines, on the north slope of the south central ridge near the west end. It is a dense forest of many sizes of trees, including dead ones. The road winds down toward the western coastal benches. There we cut south to Canada de los Sauces del Oeste, where we descended into a bluff-walled arroyo not far above the sea. There on one bank lay a great tree—maybe 50 ft. long, its bole half buried. Lyndal tells us it is either a Douglas-fir or a redwood (neither on the island now) and dated at 14,200 years old. From the bank protruded bits of wood, whole logs and other fragments. I found a cypress cone. A dogwood has been found, a *Myrica*, and others. We left and went up a steep road and then down a very steep decline to the beach. The road ran there behind the debris-filled barrier bar to the Christi Cabin in the main canyon. It's a dilapidated shed and red-roofed cabin with porch and TV antenna and one other outbuilding. It's used by island hunters who take pigs and sheep. The hunters there were cleaning some pigs and sheep heads were on the ground. We turned west over rolling fields, along steep grassy bluffs and finally out onto the terraces of the west end. It was a wild ride with Irene and Nancy threatening the men with various dire things, much singing of various kinds of songs, etc. We stopped above the beach and walked down to the sand to eat lunch. Gray skies and fog not too far above us made it a somewhat bleak scene. The sea broke on the north shore where the waves roll in from around Pt. Concepcion. On the south it was quite calm. The tide was dropping, so we could walk out into the intertidal. I identified birds, finding quite a number in the area. On the offshore rock many cormorants, probably Baird's, roosted. A great blue heron stood, shoulders hunched and white face peering nervously toward me. On shore black turnstones pecked over intertidal rocks in loose flocks, thin black and white wing patterns flashing as they flew. Many black-bellied plovers in winter plumage stood on the beach, and some probed amongst the meadow grass upon the bench. Also in the grass were very dark horned larks, lark sparrows, and savannah sparrows. On the sand the sanderling flocks ebbed and flowed with the low surf. One godwit, a few curlews, willets, and two snowy plovers were seen.

I sat on the dune edge watching two harbor seals travel along the beach, inside the surf zone, within a few yards of the beach. The seals (a pair) traveled about 25 yards apart most of the time. As a swell came in, even though the seals were facing the beach they could submerge with precision before the wave broke over them, I suspect from feeling the undertow.

Some times I saw them in the wave crests with the light behind them. They flowed in an arc down toward the bottom. As they approached the rocky shoal at the end of the beach one came to the surface, rolled and slapped the water with its pectoral, rolled

at the surface and submerged, coming up in the other direction. I saw the maneuver once more and a course change followed. The slap may therefore be a sound signal.

Later I walked up on the great shell mound on the east end of the point—rising maybe 50 ft. and covering 150 yards—pure shells, mostly small. Green grass grew conspicuously over the shells. I saw a few large shells, but mostly small. I wonder if the intertidal invertebrates had been grazed down by the people. Only small barnacles, limpets, etc. remained. I noted *Norrisia norrisiae*, cracked right down the middle, equatorially. I wonder how.

Irene took the wheel on the way home and it was a wild ride for a time as she started and stopped, squared corners, etc., but she took us safely around the road, clinging to the steep hills nonetheless. Nancy Dockery took over before we got to Christi Cabin and gave us a fine ride home—as good a driver as I’ve ridden with—just prop her up with a pillow and let her go.

On the way back a fox ran into the road in front of us and down the road. We slowed and stopped. He did too, looking nervously over his shoulder. A tiny little fellow, all foreshortened in his dimensions. Finally he scrambled up the bank to a grove of *Quercus dumosa* and disappeared.

Back at camp we ate “eggplant parmesan,” a concoction looking but not tasting like it. Val Knudson gave a fine report on the indian history of the area—maybe extending back as far as 38,000 years. One artifact was a walrus tusk figurine perhaps brought from Bering. Early peoples lived on the shore, and subsisted on shellfish and marine mammals largely. Later, a highland people developed under overpopulation. There were as many as 200 villages, friendly but separate and allowing no intermarriage. Bone and shell fishhooks came only when the highland people developed.

To the sack after much guitar music and singing.

December 13, 1973

Santa Cruz Island, Santa Barbara County, California

This morning spent writing notes and generally getting caught up on laundry, etc. Some went diving—Val, Hal, Lambert. Then, in the afternoon, after a rousing volleyball game, we drove to the pines for a look at the flora. We went to the west end grove. It was cold, overcast and misting. We drove to the ridge trail, hopped the fence, and began to look at the plants. The pines are small—maybe 30 ft. in the biggest, and 6-8 in. through. The pine (*Pinus remorata*) is distinguished mostly in cone morphology and is considered distinct from *P. muricata* on the mainland. It’s on Santa Rosa and in a fair grove at Lompoc on the mainland in Pine Canyon. That’s also where the southern Doug-fir are located.

Two manzanitas were encountered—an island endemic *A. insularis*—smooth bark with a rosy or bluish bloom that can be rubbed off and a lower denser *A. subcordata* that has tomentum on leaves and branchlets. We tried to psych out why some of the pines were dying. They seem to die from growing tip downward and out toward the ends of the branches. There were many galls on the branches, fleshy growths with beetles burrowing around the margin. The beetles were tiny little fellows, covered with hairs. I suspect they are probably tactile and help in excavating [?] within their burrows. But galls were as abundant, almost, on healthy trees as on dying ones. Galls all the way around a branch did not seem to spell its doom. I guess that they are not directly responsible for the

dieback. As white scale insect was common on needles too but didn't seem responsible either. As I recall the galls were immense at Pine Canyon, too, and I recall no dieback.

We descended to the canyon bottom—a number of interesting plants were encountered—a feathery low little *Adenostema*, two buckwheats, one endemic here and one from Santa Catalina, a *Comarostaphylos* (summer holly) that bears some resemblance to manzanita (they're both in the same family, Ericaceae).

On the moister slopes we encountered a gooseberry (*Ribes thacherianum*) and a chaparral currant (*Ribes malviflorum*), wood fern (*Dryopteris*), coffee fern (*Pellaea andromedifolia*), and a *Polypodium*, the latter very common in the deepest canyon. A broad-leafed canyon sunflower (*Venegasia carpesioides*) grew in the deepest canyon. Toyons grew very broad leaves in the shade and were very common. The rooting of pigs had disturbed the forest floor. We scrambled up the bank, breaking brush as we went, finally emerging on top of the ridge in the dripping fog—it became obvious that the trees might obtain much water from these western fogs.

Back at camp a fine party and split pea soup and garlic bread—the main effort concerned faking out some hunters who were to visit us. We had a nice prayer meeting planned—Sister Rosemary Irene was going to sing a little song while we held hands; Brother Dave was to give a little cautionary instructional lecture (“ping bong, ball of life” was suggested) . . . and then apple-cheeked Nancy would tell her little parable ending with a great curse. But, woe, the boys never came. [drawings of Dr. John Vanderburgh] During all this I was being plied with Jim Avakian's gin. Much singing, jig dancing, etc. Then to bed. It was a party for Hal and Dave who were leaving tomorrow.

December 14, 1973

Santa Cruz Island, Santa Barbara County, California

Notes this morning and then a trek to the Prisoner's Landing to see Dave and Hal off. They both were sad to go as this is the last trip for our group—perhaps particularly Hal who gave us a nice heartfelt send-off last night.

In the afternoon we ran transects in the oaks. I chose a place for the 100 ft. rectangular quadrant. It proved to have about 100 nettles and I identified one by smelling it. My nose tingled for a day.

The others ran linear transects up on the hill. Rob, Sharon, Val, and I ran two quadrants on salamanders, one on an area 10x10 covered with rotting oak logs and bark, the other in rocky rubble. We found *B. attenuata* only in the oak transect and *B. pacificus* in both.

After the transect was complete I drove the truck back (we were about ½ mile upstream from Prisoner's Harbor).

Back at camp it came to pass that the Vanderburgh Circle was formed, a natural history society that will be the sequel to this class and will, it is hoped, have trips to various points of interest. Maybe the first will be to Sierra San Pedro Martin—we will have stationery, a song, a flower, a rock, and heaven knows what else. Peggy Ledyard came up with the Vandeburgh name. Later, on a hike up the canyon I suggested “Circle,” which was deemed OK by some, too religious by others, and Nancy liked “Band” better—she snarled as she said it having visions of groups of students charging unseen foes. Well, it seems to [?] something's happening.

We looked at the moon and Jupiter and Venus with the Keeler-Wolf's Questar. Spectacular! We talked till late. Sharon and a grad student from UCSB who has worked on Embiotocids. To bed after midnight.

December 14, 1973

Santa Cruz Island, Santa Barbara County, California

Up at 4:30 to look for the comet. A bunch of us piled in the jeep and headed for the ridge above Willow's Landing. The cold of the valley gave way to the surprising warmth of the ridges and we found it quite comfortable. No comets graced the sky so far as we could see, but it was a nice dawn.

Back at camp after dawn I caught a few winks till 10 AM and then set off on foot to the narrows to look at the creek. Canada del Medio (Central Valley) winds up as a broad arroyo filled with very dense *Baccharis glutinosa* patches, narrows, and finally enters a steep winding rocky defile. The stream surfaces well before the canyon and becomes a nice creek with waterfalls, rock pools where stones have swirled rounded pot holes in the dense porphyritic andesite. We looked at the stream insects of which there were quite a number.

Web-spinning caddis flies had their little silken nets tucked at the edge of rocks where the current was strong. In one rock crack where the water slid over at the beginning of a cascade the little nets were lined up one after another. The larva lay off to the side inside a silken tube. All over the face of a smooth boulder were diptera larva, the suction disc on the tail holding them to the rock. Their heads could be seen wiggling back and forth in the swift sheet of water. Upstream in a deep pool I found a number of other forms—dragonfly larvae of two types, predacious diving beetles, back swimmers with their abdomens all silver with air held in hairs against their bodies. The water was crisp and cold but no mind. The crew dipped, screeched with the cold, dried off and dipped again. Up the canyon were potholes worse by the water with maidenhair ferns hanging from the roof.

I hiked back early to go over to see Cary Stanton at the main ranch. He had invited me over for a drink. We talked of this and that—of his ranch, of his relations with the station, etc. I had a very good feeling from it all. He has demanded certain things, all reasonable it seems to me. He wants real work done, he wants to be informed, he wants to pass on anything that might affect the ranch. Now that these things are understood and the people at the station are reacting properly the relations seem excellent. Lyndal and Paul, his assistant, I think, are doing an excellent job. The station is being used pretty fully and I suspect a lot of good work done. Cary is obviously proud of this and keeps a file of all published papers. He watches things like a hawk and people hear from him when things aren't according to hoyle[?]. A couple of drnks later and I came back for dinner. Notes, general horsing around, and bed.

December 15, 1973

Santa Cruz Island, Santa Barbara County, California

Up rather late, got the crew off in various directions on a sort of elective hike day. Sharon, Peggy T, and I got a spare jeep from Stanton's garage and we were off to the Pozo Canyon area on the west end. It was a bright, clear day, brisk, cirrus overhead, no breeze.

We bounced up the road past the pines and could see out over Santa Rosa to San Miguel beyond. We cut off on the Canada Sauces Rd., up over the grassy hills to Sauces, down into the canyon where the big tree lay in the sand, up a steep two-rutted track past some acres of wind-pruned *Quercus dumosa*—low, rounded shrubs a foot or two high sliced clean as if by clippers, rills of [?] where the wind funnelled up from the NW, about from Forney's Cove. The road wound up on the crest of the gullied, treeless hills behind us to the east. Ragged Peak rose, a few straggling pines at her crest. We wound down the hills toward Pozo Canyon. To our left a barrier canyon ran north toward the crest—Well Canyon. I stopped the jeep and we hiked through the grass down to the canyon bottom. We trekked up, seeing float[?] of a fossiliferous formation. Not long afterward we came upon bedrock on the walls—molluscs, [?], gastropods—and later we came upon the entire floor of the rill covered with *Turritella*—in the Upper Paleocene Pozo Formation. The *Turritella* shells were up to 8 in. long or so, many eroded so the interior chambers were exposed. We noted that they were darker than the surrounding matrix. Does entrapped sand in a fossil go dark and anaerobic and thus remain dark-colored, even through 70 million years?

We returned to the jeep and entered Pozo Canyon, going to the beach. We watched it both ways from the canyon, a long curving strand of clean sand, kelp offshore, a single sailboat and much flotsam on the beach. To the east we found the bluffs full of fossils—big pectens, many barnacles, some kind of burrows about 2-3 inches broad, layers piled upon one another, some branched and as much as 20 inches long. I suspect a burrowing clam.

Peggy is a collector of shiny things. She assembled an armful of abalone shells, wavy top shells, and others, I think by beauty in her eyes. She had a black abalone which had been eroded clean on all surfaces, down to the pearly base nacre.

Our time had run out so we returned to the jeep and drove back in the cold of late afternoon, the breeze at first in our faces and then as we turned up Canada del Medio (Canada del Portezuelo) it went behind us. Ravens followed us and flew in front of the [?]. At the *Eucalyptus* grove we came upon the Devil's Peak hikers—Bea, Craig, Peggy, and Nancy. They were tired from a long walk and jumped in the back for the walk in.

At camp we had a fine sheep dinner and Carey Stanton came and brought two cases of beer. Afterward much organization of the Vandenberg group took place. The bone of contention was to decide between the Vandenberg Circle or Band. The athletic types lined up on the side of the band, and the more reflective folks on the side of circle. No solution could be arrived at by sheer speech making so I suggested contents—a tug of war, leg wrassling, and balancing.

We chose teams and amid much shouting, threats, singing, general hilarity, etc. the tug of war took off—after a false start or two the bands won decisively in the tug of war. In leg wrassling Val, a novice and a band, was matched with that old pro Irene, a circle. Amazingly Irene lost 2 out of 3. Bea was matched with Dave. Though I knew Dave to be tough he proved no match for Bea who flipped him without hesitation. Then, because the circles said it was all too jockish and physical, we inserted a balance test. The opponents stood facing and with feet planted, hitting at each other's hands. Lambert and Nancy went at it—Nancy, of course, a "band." It was beautiful to watch—a pair of pros. It went 1:1 and then Lambert took the last—a victory for the circles, but too late—so the Vandenberg Band we are.

People faded off to bed—tired after long walks. Finally, at 12:30, I took myself off for the sack.

Granite Mts., San Bernardino Co., California, April 13-May 25, 1974 (class)

April 13, 1974

Granite Mountains, San Bernardino County, California

The hiking class assembled yesterday about 6:30 PM and we drove off into the night in our 40-passenger bus. We headed down Hwy 5, got lost, went through Arvin, and finally up into Tehachapi area. We turned off on a little road and camped not far off the highway. Nancy and I slept on the dead-end road, but most others slept off on the dirt at the sides. It was incredibly noisy—trucks revving engines as they shifted to make the grade and then the railroad on the other side of us. Noise or no, I finally drifted off to sleep.

Next morning we found quite a few interesting plants—swallows nesting under an overpass, red-tailed hawks nesting in a digger pine nearby.

Finally off we went over Walker Pass, looking at faults and ecotones. On out into the Mohave Desert, where we stopped, caught *Xantusia*, and a lot of flowers of various kinds. We drove on, and I folded up on the deck, getting a nice snooze. [List of students in Natural History Class, Spring Quarter 1974]

After a number of pit stops at various gas stations we hit the new freeway at Ladlow, shortly crossed the Bristol's, and cut off at the Kelbaker Rd. Excitement mounted as we came closer to the mountains and as we bumped down the dirt road under the towering granite pinnacles and as the bus scraped fore and aft the gasps and squeaks grew too. But we made it and unloaded at the top of the hill, quickly portaging all gear up to the cabin. Susie and John were there looking a bit perplexed at all the people (31). Lots of appreciative remarks at the Bunny Club and its remarkable contents. The weather was clear, warm, and with mild breezes sweeping across the bajada. Flowers were scattered and we had seen few places where carpets of color could be found. I suspect the fall rains hadn't been adequate.

We took a walk past Cove Springs and found no surface water at all, but Canterbury bells, paintbrush, and many other animals. We saw the color matching of the horned lizard, watched utas and birds of various kinds and finally wended our way back to camp for dinner and a good session on geomorphology. Then to bed, everyone tired and mostly flaked out on the front porch under calm skies and stars. I occupied the hanging gardens.

April 14, 1974

Granite Mountains, San Bernardino County, California

Up this morning for observation day. My job was to take out groups and work with their ability to write down what they see. My first crew was the anthropology group and we had a nice hike down to the tanque—catching a chuckwalla on the way, spotting birds, and looking at the flowers. At the pond we finally decided to describe fringillid flight. A group of purple finches was flying around the pod, settling in yuccas and on the bank of the earthen dam. They could usually be seen flying over the water so it was

possible to refine the observations. We finally began to see details—the two beats, the patch of wings downward so they almost touched beneath, the dipping flight. We quantitized—timing dips and estimating how far the birds swooped with each dip. A flycatcher flew by and was at once obvious by its flight. Doves swooped in an almost straight flight, swift backward-directed beats sending the bird along. Unlike fringillids there were pauses between each beat but velocity was so high the bird scarcely dropped at all, while the fringillid might drop two ft. or more. It was a good exercise though people seemed reluctant to write down what they saw, preferring to speak their observations. But since I wanted feedback from the writing process, we persisted until everyone had something on paper.

After lunch I did it all over again but this time with utas. We watched how they bobbed as they explored their territory—two quick nods of the head, a pause, a quick two or three ft. of locomotion, more nods, and so forth. The nods were initiated by push-ups and seemed to involve a sort of whipping of the head up and down. We watched this lizard make a circuit of his area and nearly come back to the home area where we had originally sighted him.

After working with this for a while we hiked off down the canyon nearby, watching birds—black-throated sparrows trilled at us from bush tops, a beautiful Bullock's oriole, black-chinned hummers, vireos, and an ashy-throated flycatcher.

On the hike back Liz Amadon called "snake" and there was a gopher snake almost completely in a mammal burrow, only part of a coil occupied by the burrow mouth in a patch of sun. The animal was warming while nearly completely buried. I tried to extract him but he crawled down the burrow. When I began to follow the burrow he appeared six ft. away at a burrow mouth, finally emerging where I caught him and showed him to everyone. We then let him go in a yucca clump.

One thing we saw that interested us all was desert rhubarb (*Rumex hymenosepala*). It is a very succulent green herb and when touched proved to be several degrees cooler than the air—so cool in fact that it was distinctly cold to the touch. It must undergo great transpiration.

Back at camp—burritos, reports, and notes, and to bed after a hike to see if the red-spotted toads were breeding. They weren't but the night was beautiful and clear and full of stars.

Oh yes, today we had a face down with Art Parker. He is a young, red-haired, heavy-set fellow who seems seldom to speak the truth. He started off by walking briskly to the bottom of the hill and calling for me. I'd said, "Come on up." "I can't," he said, "I've got a bad leg." Baloney. Five of us went down—four with notebooks and pencils and me. I had Val, Jerry, Stan, and Brendan write and not say anything—just write. It was a strange confrontation in which Parker admitted he didn't own the land, had no control over our comings and goings, and couldn't tell us how many people could come in. We agreed on various things to protect his cattle operation. His sidekick said, "What are those guys writing in shorthand?" Well, it kept them honest for a change if it didn't buy us any public honors.

Point Reyes Seashore, April 26-28, 1974

April 26, 1974

Laguna Ranch, Point Reyes Seashore, Marin County, California

We gathered everyone together by about 6:00 AM in the big blue bus and headed north up Highway 1. I drove my pickup as we would need it at Pt. Reyes. The skies threatened and spells of rain washed our windshield as we went through Samuel P. Taylor Park to Olema and finally to the Park Headquarters. The usual switch with the bus being unloaded above the Hostel and gear taken down and stowed. Finally all was done and half an hour later we were back at headquarters with everyone gathered round ready for the hike. Showers still came and gray clouds scudded up from behind Mt. Whethenberg as we set off down the trail, all strung out single file. Various marvels were found. There was a wild somatic mutant dandelion with an inflated stem and a broad, brush-shaped flower. Other flowers sprang from the stem [drawing]. Many flowers were out and everything was washed and clean and the sun began to come out.

We cut off at Meadow Trail, climbing through tanbarks and Doug-firs to a sunny mead where we had lunch, everyone sprawling on the grass, eating and catching their breath.

Up and away to Slay Trail where the Doug-fir-red elderberry association occurs. The firs I'm convinced have very many more secondary limbs here than in any firs I have seen—dozens on a single trunk and most are dead, lichen and moss covered. The forest floor is strewn with lichen and branch fragments. These epiphytes catch aerosols and dust and nitrogen—wind and rain sweep them to the forest floor where they must represent an important addition to the nutritive budget. Perhaps the limbs are adaptations to being near to the sea, as they are in some other shoreside plants on the North Carolina dune shores. In places these trees assumed the growth shape of cypress trees—multiple trunks and dense lateral branches—once again unlike other Doug-firs I have seen.

Down the coastal slope we went finally emerging into the chaparral and a magnificent view of Pt. Reyes—the sea was calm and shining with the Farralons very clear and sharp, the sweep of Drake's Bay, the esteros and the bluffs clear. We went to the bluff edge and hung over about a 200 ft. drop, watching the surging sea below. Now on the shore trail we strung out in a long line, each looking at this and that—a pair of hunting marsh hawks, one much grayer and lighter than the other. The brown one came up with a mouse from the grass. We were weary when about 4:00 we crossed the creek and staggered up to the hostel.

Dinner, notes, a little talk, music, and bed. We're out in the old milking shed, in the stalls. OK, the place is a little straight but I guess they have to be to maintain their sanity with groups coming and going. Tomorrow, observation day.

April 27, 1974

Laguna Ranch, Point Reyes Seashore, Marin County, California

Under the eaves of the AYH Laguna Ranch building are five nest sites for the cliff swallow, each perched on the cross member that holds the roof beams. A space about four inches high exists between the roof sheeting and the crossbeam on which the nests are being built. The roof overhangs about 10 inches beyond the beam and the nests and drops perhaps five inches below the nests, requiring the swallows to swoop up under the overhang to enter the nests. [drawing] The nests are flask-shaped, about five inches wide with a 2½ in. wide entrance.

Nest building. The birds fly into the nest, and if another is there they displace one another, the resident quickly leaving. Then the new resident pokes its head out of the nest with mud plastered on its bill in a fairly good-sized glob. It then places its bill in a place around the perimeter needing mud, with neck extended, draws its head backward with bill pressed downward. At the same time it “vibrates” and sometimes rotates its head from side to side, causing the mud to flow into place. The bill is open at least part of the time, and I believe the bird takes mud into its mouth and extrudes it in much more liquid form than that in which it carries it. Thus it flows into place.

My impression is that a tier of mud applications is applied around the whole opening before another tier is begun because I could see by the darkness of soil applied that it had been placed around the entire opening. The nest is built by first covering the area of beam and wall to be covered with mud with it and then building walls out and around this basic support in air. The roof is not so covered.

How do birds fly up and enter nest openings when they are required to do so in such a confined space?

First these swallows have a considerable capability at hovering. They swoop in, with the glide phase being replaced by slowing and hovering wing beats at least five ft. from the eaves and usually well below them—often two ft. or so. The bird then flaps up under the eaves in slow flight. Even so the wing beat takes the wing tips 45 degrees above midline and nearly touching on the downstroke. I heard them touch the roof occasionally but mostly their wing tips almost miraculously stopped fractions of an inch short of touching. At the last moment, as they swoop up and before momentum is lost, they fold their wings back and enter the nest mostly grasping the lip with their feet, which are scarcely extended below the contours of their bellies.

Sometimes a bird will fly in, stay a few seconds, and fly out. Apparently it drops mud in the nest on occasion. The amount of mud placed seems greater than is carried on the bill and we suspect it is carried internally either in the mouth or perhaps even regurgitated. Further it is much more liquid and leaves a wet spot wherever applied.

In a couple of occasions I could see the mud being masticated into very liquid form, applied by being flowed out onto the nest and occasionally dripping off the nest. The birds tried to catch the drips. They also pick loose bits of mud that aren't firmly attached and take them into their mouths.

April 28, 1974

Laguna Ranch, Point Reyes Seashore, Marin County, California

Observations on the mud-gathering behavior of cliff swallows.

At the junction of two dirt roads is a tiny puddle, nearly dry, that approximately spans the width of a tire track. One can see that on one bank where the bank slopes up at about 30 degrees, swallows have dredged up mud. They have left a series of marks going directly up and down slope for perhaps three miles. On the other bank, which does not slope nearly so steeply there are no marks.

Actually we did not see the birds come directly to the mud but saw them fly in low (13 in. off ground) and then view was blocked by a grassy tuft. Around the puddle on closer inspection are what appear to be bill marks. These are to be found on most of the perimeter of the soft mud except in the very center. I'm impressed that the mud is pretty hard.

We inspected the white flower heads of the cow parsnip growing in a nearby meadow and found a whole system of insects and spiders occupying the umbels. These are about four inches to ten inches across, formed of about 30 smaller heads that touch or nearly touch in many places. Each subhead is composed of about 15 complete flowers that seem to mature peripherally first and then inward toward the center. The result in a mature umbel is a hummocky platform on which an insect can travel across the entire umbel.

The odor is sweet and fairly strong. I could detect it from two ft. away. The individual flowers are complete with a low, rounded ovary from which a short stigma rises. The ovary glistens and seems to be the target of nectar-eating insects. These seem to include ants and wasps. Robber flies??? rest on flowers as does a white crab spider. Both of these were seen feeding on insects that frequented the umbel including a tiny wasp that had been captured. The flies were seen running their probosces over the ovary. As they walked over the umbel a thicket of anthers rubbed against the insects' lower surface. This surface is hairy as are the legs. Pollen was seen in the front half of the body. The proboscis has a pair of extensions that Jerry saw being used on the front legs perhaps to remove pollen.

May 25, 1974

Eshom Creek, Whitaker Grove, Fresno County, California

Allison, Larry, Eric, Wendy, and Brendan, and I went to the creek to study the niche of an animal. We settled on a funnel-net-building caddis fly larva, which we presume is of the family. The creek in which we found them is a rather small creek tumbling through granite boulders or running between low banks, sometimes cobble and sand choked or sometimes with pools as much as four ft. deep, with cut banks and overhangs under roots. In places the stream slips over granite smoothly and occasionally cascades or actually drops as short falls. I'd guess it was running about 200 gpm.

We located many nets of this caddis fly. They varied rather strikingly in size from about 1/3 in. across the mouth to ones as much as 1½ in. across. They were roughly formed of meshes and usually streamers, presumably of silk though they were covered with a grayish mucus-like material. One could watch the streamers and determine current direction exactly at the net. In my observations the current always flowed directly into the nets. Position on a rock did not seem determinate, that is nets were found under rocks, in crevices between them (most common), or even on top of smooth granite surfaces. In the latter case the nets seemed held open by the current and bowed up in a perfect arc.

[Drawing]

Size of net seemed relatively well correlated with current velocity. That is, usually small nets were in fast water, as if some relation existed concerning amount of water filtered per unit time. The nets are strong. They could hold a section of branch that drifted into them and which filled the entire net. Often it could be "rolled over" the upper net strand without breaking it. Nets taken out of water collapse into a tangled mucousy web.

We found no nets in still pools and most in cobbles at the lower end of pools where water quickened between stones. Nets sometimes faced upstream but always the

pendants revealed that the current also went that way. The deepest net was perhaps six inches down the shallows and had the lead strand at the surface. The larva were seen in the net but more often off to the side in rock-encrusted cases.

They move underwater inchworm fashion, first clamping with anterior legs and inching the body vertically under, then apparently clamping down with the posterior hooks of the abdomen. Wendy saw one such animal swing its anterior body around 360 degrees or thereabouts while so hooked.

We watched one crawl underwater in this fashion from still water into more and more turbulent deeper water and finally lost it at about six in. whe I disturbed it and the current wafted it away. We concluded that either the animal selected life conditions by a statistical loss of those who fail, or by sensing water velocity. We decided it had probably to be a relative sense, i.e. water velocity past something. We tried to test this by letting larvae select velocity but the results were inconclusive. We did note that they could spin threads and that they seemed to issue from the anterior abdomen rather than the posterior end.

We speculated about dispersal and concluded that [?] stream pattern might help but so would adult dispersal. We pondered the effect of wind, and of snow and cold, wondering how long they live and how they overwinter.

Yolla Bolly Mts., Tehama Co., California, June 7-9, 1974 (class)

June 7, 1974

Pettijohn Basin, Yolla Bolly Mts., Tehama County, California

The class piled into the old blue bus at 10:30 PM and we drove off in the dark toward Corning and the Yolla Bollys on our last field trip of the quarter. The bus hadn't been filled with gas so by the time we neared Davis and the cut off to the north it registered near zero. I rescued the operation in Davis by [?] 15 bucks in cash. Then off to Corning again while I tried to catch some sleep all folded in a rear seat, one leg over the arm and propped by a pack and the other wrapped around it resting on a small cornice of gear. I don't fold like I used to but nonetheless did manage some fitful sleep. At Corning we wandered around finding the Wolf farm, and finally located its pistacio-green house behind a double collonade of date palms and shaded by great black walnuts. In moments everyone scattered across the lawn and was fast asleep though the sun rose in the east and it was fully light. Once we woke (maybe three hours later) we found breakfast places in full swing—home canned peaches and apricots, dishes and utensils, paper bowls, piles of oranges and grapefruit to be squeezed, a fire started in a great old homemade grill. The wind had come up and whipped in from the northwest making my pancake cooking a difficult process. When I turned the cakes, as like as not they folded, or when I served them they showed tendencies to scale away like frisbies.

Anyway, hundreds of cakes, dozens of strips of bacon, and gallons of juice later we were done and headed off toward Red Bluff. The road out west through oak grassland—blue oaks, inland live oaks, and valley oak—many seemed to be hybrids. We wound up stream valleys and past small farms to Platira where Craig inexplicably pulled off—a tiny hamlet—and out stepped Dr. VanDenburgh—sporting a double beard, only faintly tinged with gray. He jumped in a pickup and drove off to turn off shortly. I

thought at the time that the faint gray might bode ill for old folk and cover the younger members but I said nothing except, "Thank heaven we've seen him."

Shortly the road entered the forest and we went many miles toward the wilderness area and Stewart Gap, through fine forest replete with yew and firecracker plants, a few dogwoods, a strange madrone that is much more yellowish green than our coastal form, and other wonders.

At Stewart Gap we hoisted our packs and started up the trail toward Pettijohn Basin. The forest is relatively mesic; golden brodiaea and ribes. Squaw lettuce (*Hygrophillum occidentale*) was everywhere and in bloom, a little cluster of whitish flowers, heavily dissected leaves, with yellowish green. Not long after we passed the Wilderness border, the trail leveled and finally dropped abruptly over into Pettijohn Basin. It is a rimmed, sloping meadow that is centered by a rushing tumbling ice cold stream, largely fed by melting snowbanks back among the white Doug-firs and ponderosa pines. On the upper slopes of the meadow are fields of *Veratrum* (corn lily or skunk cabbage). Down in the fold of stream flattish patches of stream alder (*Alnus tenuifolia*) crowd against the stream. Far up on the slopes, snow is deeper, clinging in multifingered patches in the avalanche chutes and over north slopes. The highest trees are foxtail pines, like those of some places in the Sierra.

Camp was made back in the woods where we found a nice fire circle and where a springy duff of pine and fir needles covered the stones of morainal deposits. I turned everyone loose on their own (a book told where they went) since everyone was too tired for useful intellectual effort. I trudged off with mildly aching feet toward Black Rock Lake, 2.5 miles to the west. The trail looped up the slope, dipping into valley folds and skirting ridges, almost always in deep forest. Finally the lake appeared, a tarn set in a cirque—shallow, mud-bottomed, logs lying here and there, a rushing cataract entered from the cirque. Here and there fish broke the surface and many rough-skinned newts (*Taricha g.*) crawled on the bottom.

I caught two nice rainbows and lost two more—enough for dinner. On the way back my foot began to hurt and by the time camp was reached I knew I was in for it, and that my vision of Dr. V. was right—he was for the younger folks this time and I'd have to take my lumps.

Nice campfire in the brisk night with Todd and Ginger telling us about the flora and history of the mountains. Nice discussion and off to the sack.

June 8, 1974

Pettijohn Basin, Yolla Boly Mountains, Tehama County, California

I woke up with my foot aching and it was soon obvious that I would spend my day with meadow. Only with the hiking stick I had picked up the day before could I navigate. Feels like a bone bruise or something like that.

After breakfast we all sat under a huge old ponderosa pine and talked about energy in nature—about how trees obtain carbon, how they respond in terms of balance with growth. How do buttressed bases on trees develop? How does the poised distribution of limbs develop? Then we talked about decay and how nitrogen gets in the soil (fixation, lightning), and how and what travels up trees. I discussed and asked questions about energy coming in from the sun . . . UV, IR, energy windows, etc., black and gray bodies, about re-radiation in trees and why it is warmer 30 ft. off the ground.

The two teams were dispatched—one to measure organic materials contributed by the mountain alder grove and the other to see if they could get a measurement of contributed organic materials from conifers by measuring the debris collected on top of snowbanks. They were equipped with 72-in. bootlaces and a weight watcher's scale. Walter Ward went off to measure light regimes using a hand-held light meter.

It was a pretty spring day, clear mountain air, warm sun in the meadow, and cool in the shade, few clouds, just mountain blue sky above and the $\frac{3}{4}$ moon above Black Rock Peak. The skyline is fringed with foxtail pines while the meadow is bordered by ponderosa pines, Douglas-fir, and a few magnificent old incense cedars and sugar pines.

I sat down to read the gospel according to Philip Munz—to key out plants. The meadow was full of ones I didn't know well. Most I could take to family or genus, but seldom beyond. I worked on one little white-flowered carpet plant, digging (I found it had a bulb), and finally ran it down to *Lewisia*, named after Merriweather Lewis. There were three other members of the same family there too. Finally I strolled around (slowly) looking for birds and came upon a number—white-headed woodpeckers, and red-breasted sapsucker, red-breasted nuthatches, chickadees, and a fine dipper—what a sleek bird, every feather in place, and every curve so perfect. It stood “dipping” on a log in the stream—finally drinking and then flying upstream among the alder branches with its quick wingbeats.

People straggled in, mostly from the lakes and ridges, which they said were spectacular. Larry Hobbs and party, who were to weigh alder leaves had instead calculated productivity in skunk cabbage (false hellebore) and gave a hilarious report, filled with new units of weight, area, productivity, etc. and finally related it to the cosmic all. Everyone dutifully hummed “Aum” and Walter told us about his light meter readings—I was surprised by the intensity of light transmitted through many leaves and of the amount of scattered light. It is $\frac{3}{4}$ or so, as much as direct sunlight in [?] places. The snowbank crew came in with ground clothes full of debris and good stories to tell.

We had a fine campfire—much discussion of Zen, purpose, systemic thinking, etc. Off in the brisk night. It did get cold, and my wool shirt was welcome.

June 9, 1974

After breakfast I packed my gear and headed slowly down the hill, learning plants and watching for birds. The others are to leave at noon and we will all board the bus for home. Another perfect day. I stopped at the Wilderness border where a nice spring issued from the hill. Amongst the alders were bleeding hearts (*Dicentra*) yellow violets, *Montia sibirica*, and other plants. A few draughts of the cold, sweet water and I trudged on down the hill, listening to the olive-sided flycatchers on the tree tops and pileated woodpeckers singing their raucous, insistent call.

It was hot and 1:00 PM when the old blue bus showed through the trees. Quite a time later the last straggler was in and Dave headed the bus down the long winding mountain road. Todd and Ginger were dropped off, a tire changed, and we watched the sun set over the hills as the bus rolled along in the dusk. I'll end here as it is getting dark.

La Paz, January 24-February 6, 1974

January 24, 1974

La Paz, Baja California del Sur, Mexico

I guess we'll make it, providing the bureaucrats let loose.

January 25, 1974

Lopez Mateos, Baja California del Sur, Mexico

Up at 6:00 AM, breakfast at the hotel and getting ready to leave by bus for Villa Constitucion. I called Joe Blum in Washington and he told me the permit might be ready this afternoon. I was to call back at 4:00 PM Washington time. Well, OK. Off we went by the nice big bus up over the foothills of the Sierra Giganta and Magdalena Plain. We called at Villa Constitucion and found our permits were finally complete. Whoopee!! Jose had arranged for the bus from Escuela Superior Tecnologia de San Carlos—the local fishery school—to take us down to Lopez Mateos. I had it stop on the plain not far above town to look at the creeping cactus of Magdalena Plain—like logs of cactus half buried in sand, most a yard to two yards long or so.

At Lopez Mateos we found our rooms at the cannery. We're OK. No one had been sure Jose's arrangement had been with people in La Paz. The rooms were next to the little lab across from the fish meal warehouse and downwind from the fish oil tanks.

The *Louson* came in just as we landed and we found Roger Gunty and Jerry Koozman on the beach in Jerry's camper. Whales were spouting down the bay and all seems in order. We can't work at the cannery and will have to rent a place in town tomorrow, but it goes remarkably well considering everything. Even the smell fades after a while.

Dinner at the local restaurants—tacos, burritos, and tostadas only, but sufficient. We walked back in the dark and began readying gear. Tomorrow we hope to calibrate gear and maybe get our expansive harness on a whale. Whew! So far it's falling into place, looks like.

January 25, 1974

Lopez Mateos, Baja California del Sur, Mexico

A good sleep in spite of late tinkerers assembling the harness gear and a midnight anchovetta haul.

Well, we're off in an incredible flurry of paper, hoping it will all clear away and we will have a chance to go to work. The trip is the second time harnessing whales in Magdalena Bay and I never had so much confusion and trouble with the bureaucracy as on this effort. Our funds from NASA came after the project termination in December, leaving us almost no time to prepare; the Marine Mammal Commission did not provide permits until this morning by phone, our whole operation was cancelled last week by NASA by an official who was frightened of publicity and restored next day, and the permission from the government (US) was cancelled because of passage of the Endangered Species Act, which carried a 60-day moratorium. We were reinstalled next day when a loophole was essentially constructed for us (we were working in Mexican waters under Mexican permit)—which we didn't yet have. They came along with Jose Castello later. But I dissembled and we were allowed to go on.

Our passenger list includes me, Roger Gentry, Larry Hobbs, and Tom Dohl of UCSC, Paul Sebesta of NASA Ames, Bob Goodman and Bob Gibson of Franklin

Institute, Jose Castello of Direccion General de Educacion en Ciencias y Tecnologia del Mar, and Sig Rich of Bonny Doon, and Jerry Koozman of Scripps.

Sig picked me up in the dark, we went to UCSC and picked up Tom and Larry, and headed for the airport. At LA I was called in and informed by phone that we could not work until the federal permit was issued in Washington DC. At Tucson Tom was to pick up an underwater housing and was stopped briefly by authorities. We made it.

A nice flight to La Paz over the Gulf islands. There we found our hotel reservations hadn't been made and everything was filled. We talked them out of rooms. A nice dinner and bed. The weather is lovely, calm, crisp, and clear with fine Baja sunset, the night balmy and bright.

January 26, 1974

Lopez Mateos, Baja California del Sur, Mexico

Up at 7:00 AM, nice crisp calm morning. Fog lay over the water like unrolled cotton. The *Louson* floated in it nearly to her gunwhales and one could not see the water.

A group went on board after breakfast to set up the antenna and test the radio transmitter.

Jose, Bob Gibson, and I went off to arrange for a cookshack for our people. We found one in back of a house across town that we can use. It's not much but we can prepare meals there and avoid costs of restaurant life. On our way back we visited the local theatre to see if we could show our 16 mm movie (the material from last year's trip taken by Jose Castello). The theatre is a plywood cavern with a dirt floor and rough wooden benches, a screen pointed directly on the wood, and two ancient projectors in back. OK, the proprietor said—in the evening. There is a show every night.

We set up a stove on the beach next to Jerry's camper and cooked up some coffee and made sandwiches surrounded by local kids just curious to see what we were doing.

I watched gulls and concluded I could identify Western gulls and herring gulls in the group, plus many unidentifiable (by me) immatures. Frigate birds are common, often diving amongst the gulls in swooping dives. There's just one here, *Fregata magnificus*.

In the afternoon I went on board and worked with the crew trying to calibrate the automatic direction finder. We hoisted antennae, checked cables, and for a very long time had either no response or a great ambiguity. Bob Goodman and Lanz finally isolated the trouble in the cables and ultimately fixed it. The whaler circled us far out and we were able to get a good continuous fix in it. It was dusk by the time we headed for shore and to the new cocina across town. Rog had cooked an absolutely splendid spaghetti using Portuguese hot sausage. That with salad and fruit, coffee, etc. made a fine meal.

Back at the cannery we watched with wonder as Bobs Goodman and Gibson demonstrated their remarkable little recorder and circuitry pod. It was tested by switching a bank of tiny switches on in sequence and reading the output of each part of the circuitry on a tiny light-emitting diode. This flashed in patterns which indicated the health of each component. It's beautifully compact and incredibly well thought out.

The field crew then had a meeting and decided on a protocol for tomorrow's intended capture. It will be a tight and complicated sequence with camera men, people monitoring behavior, respiration, tidal volume and air velocity, taking measurements, [?] for heart rate loci, listening for sounds, harnessing and hauling the animal in. Now to the

capture. We'll see. Then much scurrying about for each person to get ready. This all took till 2 AM but I went off to sleep earlier leaving folks chattering in the hall.

January 27, 1974

Lopez Mateos, Baja California del Sur, Mexico

Up before dawn and down the rutted sandy street to our cocina where breakfast was cooked (oatmeal and nuts) and served. The hot cup of coffee was most important.

Gear assembly back at the room took a long time—about 1½ hrs., and then to the *Louson*. We hauled up the anchor and went down channel to the south, passing a number of whales enroute. Down toward Colina Coyote we could see many spouting whales throwing their flukes and spy hopping. At about “Shell Mound” a mother-young pair was encountered with a baby small enough to take the expansible harness, which is our first test. We have set the soluble magnesium bolt for seven days and hope to retrieve it in the lagoon.

After some preliminary tests capture was started and the counts in the enclosed statement took place. In short, the baby whale died during capture, throwing plans into chaos. Should we attempt to hide the death? Well, aside from the fact that it could hardly succeed, and that it could lead to all sorts of additional complications, it was also distasteful to us all. Paul put it well when he said, “We’ve had enough of that sort of thing in our government lately.” Jose was worried that the Mexican authorities wouldn’t allow us to go on. So be it, we finally said, but it’s better to lay it all out on the table anyway, especially since our permit said that in case of a death we must report immediately.

So, much saddened and uncertain, we returned to shore. Bob and I constructed the statement appended and read it to all hands on the afterdeck at the *Louson*. A few minor changes were suggested but it remained substantially as we had written it.

On shore we laid plans. One group would photograph whales from the *Louson* tomorrow while Bob, Jerry, Jose, Paul, and I would go to Villa Constitucion to place various calls. Finally, off to the sack after dinner and conversation, gay, yet a front as everyone knew. Sig’s harmonica helped as did Larry’s limericks and the stories of others. Bob Gibson proves to be a treasure trove of old songs, which he sings in a nasal Philadelphia accent. Good crew all around and I think everyone is relieved that we’ve taken the straight course.

January 28, 1974

Lopez Mateos, Baja California del Sur, Mexico

After breakfast we divided into two groups; one went on the boat to listen and to photograph. Bob Goodman, Jose, Paul, Jerry, and I wet in to Villa Constitucion to call various parties.

There is one phone in town, in the supermercado, and is attended by a girl who threads her way through the thickets for you. One instructs her, she fills out a form containing about 10 blanks and then you wait, wait, wait. Finally, she rings in the single phone booth and you take over. In this way we called Washington DC, Ames, Santa Cruz, and Mexico City. The upshot was we read to secretaries the enclosed statement and Washington was hopeful, Ames wanted to help, and the U.S. Fisheries Attache George Rees said he wanted to pocket the report and that we should go ahead since it was an

accident. This took all day and we were exhausted by the end after standing first on one foot and then the other all day wrassling with the bureaucrats. But in aggregate we should get an answer from the US soon.

Back at Lopez Mateos we found that recording had gone well with some interesting, rapidly pulsed sounds being recorded in the presence of whales. If they are mammal signals they certainly are like no porpoise sound.

The photography was less successful. Tom's fancy Beaulieu had troubles with its automatic diaphragm and the whales didn't behave. I had three of Bob's gins and was feeling nearly no pain by the time dinner was over—which was fried grouper and delicious.

January 29, 1974

Lopez Mateos, Baja California del Sur, Mexico

Out on the boat today. One group took a hike around the entrance to the Boca and down the outer coast while Tom, Sig, and I made a census of whales from the Boca to Devil's Bend. The day was calm and clear and I counted over 200 whales. Included were some groups of adults that traveled tightly together—I wonder what was going on—mating perhaps, but most were mother-young pairs.

The Big Bay was thick with whales as was the narrow channel off Colina Coyote. That bluff and situation looks like a natural for observation—the colina is perhaps 60-80 ft. high and relatively steep on the water side and the narrow channel goes rather close to shore. I'd like to try it.

The hiking group came in and lo and behold they had a *Mesoplodon* skull found by Roger. In nice shape with even zygomatic arches and earbones. I don't know what species.

We showed Jose's movie at the local pelicula parlor. It came on upside-down, jumped around and car lights shone across the screen but we enjoyed it and were heroes to the local kids.

Dinner, conversation, and the sack. Tomorrow we call Patty again and hope for a decision. I'm not too sanguine as it seems enmeshed in bureaucracy, especially since our call to her today showed that the US people want direct clearance from the Mexicans who haven't been informed.

January 30, 1974

Lopez Mateos, Baja California del Sur, Mexico

Up before dawn for photography. Boyd ("Dildo") on the *Louson* says the whales are most active in the morning with much fluking, spy hopping, etc. We arrived in a thick fog, covering not only the channel but all vessels and the adjacent land. At about 7 AM the fog swept off the land and finally the *Louson* appeared as well as other craft and finally only a sheet of cotton a foot deep or so covered the water.

Boyd came in with the whaler and we were soon off to the *Louson*. Not long afterward we noted some whales thrashing very close to the sandy strand across from Lopez Mateos. Tom, Jose, and I jumped in the skiff and with Boyd driving we closed in on the animals. They paid remarkably little attention to us. There were two adults and one baby. The smaller adult, possibly a male, chased the female and the baby seemed at best an accessory, following as best it could the racing adults.

They rolled and thrashed within feet of shore. Boyd put us right on top of them and they rolled within feet of the sandy beach, sending boils of water up, all brown with sand. Sometimes the large adult (female?) rolled, throwing its broad flippers high in the air. We photographed and photographed until film was gone or my mirror stuck. The animals raced off across the channel, baby behind. The skiff followed them nearly two miles north toward the Boca. The baby was still with them when last seen.

Bob and I placed a call to Patty by phone patch through Oakland, it was nice and clear. They tune the antennas for your specific locale. Before our turn came we listened to a harrowing call from the "Bernadette" in which the recipient of the call, obviously a young girl (we could hear only one side), told that a man broke through her window and shot Michael twice in the head and followed this by a long rambling impassioned affair in which he wasn't really gone but where was Momma buried. "We put him in Mt. Hope." Well Momma wasn't in Mt. Hope so that was a mistake. She'd be better now. Jesus was the way and why didn't he see that, etc.

Patty sounded so calm when she told us that Joe Blum wanted to talk to me personally tomorrow and that today he was talking to conservation groups. Well, I'm hopeful.

In the afternoon, Larry came down with the Two Step and is now on Sig's drugs. I have twinges but shall wait and see. All but Larry went on the boat after lunch to go to Colina Coyote for observations and photography. Not long after, about a mile S. of Lopez Mateos, a baby whale was sighted thrashing on the beach with no adult in attendance. Seeing a chance for Jerry to get respiration data we stopped to investigate. It was a female young, ___ cm. long (over curve) in excellent shape. Jerry raced back to camp to get his gear while Tom, Jose, Roger, and I tended the animal. I found by stationing a leg firmly in the sand adjacent to its outboard eye[?] I could keep it from moving, so I stood there till Jerry came racing up with his gear.

The animal was a modest-sized young, ___ cm. total length over the curve of the body, and absolutely without either wounds or parasites. Its pattern of dark gray, black, and pale, pale gray was a most attractive one. The marks were mostly brushed longitudinally with the exception of a peppering of dark gray dots amidst the light color. It had heavy fetal folds, seven prominent ones, and perhaps a few additional shallow ones on the tail. The flukes were very flexible, more so than a swimmer's fins. The animal's ear orifice was rather large and open—perhaps ½ cm. in diameter. The head hairs were rather short—perhaps 2 cm. at places.

Both Sig and I placed our hands in the tip of the animals snout and it quickly brought its tongue forward, enveloped the hand, and caused considerable suction. I noted that once when Sig tried this the enveloping was done with the mouth partially open. The animal was able to clamp down hard enough to nearly create pain.

Jerry brought out his flow meter, which is a big, angled stove pipe with a small rubber inner tube over one end to fit over the blowhole. The flow is measured as a pressure differential across a capillary disc. He sat in the boat recording as Roger and I held it over the animal's blowhole. It reared up before breathing and thus Jerry was able to catch most breaths and to obtain some fine records.

After this session, which took more than half an hour, I did some recording. Tom held the gear and I pressed the LC32 against various parts of the animal in an attempt to pick up both sounds and heart rate. It grunted from time to time with blowhole closed and

one could see movements in the post cranial body concurrently. The impression was of swallowing or a nasal[?] maneuver. One group of soft clicks was emitted concurrent with slight opening of the blowhole and a movement of blowhole tissues.

The baby gave the strong impression of seeking the shore. Whichever direction one started[?] it, it would circle over deeper water and return to the beach. It was not a vestibular problem as such circling went both directions. It seemed calmest in shallow water when touching bottom. It rocked there, now and then circling its head up for a blow. Once I saw it lay quietly on the bottom in four ft. of water, completely submerged. Bob Goodman said it looked like it was seeking to touch a surface. This trenchant observation fits well with the penchant of babies during capture, of slithering over their mothers, especially the dorsal surface, and of lost babies rubbing or clinging, almost, alongside ships. Perhaps the abandoned baby seeks such surface contact and hence strands.

I wonder if the supposed female-male chases we have seen sometimes result in lost babies and hence in mortality. We've been puzzling what might regulate animal density in lagoons and maybe it is simply the intensity of male and female chases, that could lower fecundity and exert control.

The crew of the *Louson* reported a mating outside Boca Soledad with a male rolling over and exposing his penis. Perhaps the phalanx of males at the entrance is real and that it builds up somehow, perhaps with aggression.

A nice taco dinner prepared by Jose and the lady of the house (Francisca). An organizational meeting followed dinner, preparing for tomorrow should we be given permission to procede. We'll see. I call Washington at 11 to find out.

February 1, 1974

Lopez Mateos, Baja California del Sur, Mexico

Up before dawn and out to the *Louson*. Tom, Jose, and I went off on a rather inconsequential attempt to photograph from the skiff. The animals simply wouldn't allow us very close. At 11 AM, on the way down the channel, we called Washington, D.C., and received permission to procede. There were some conditions, mostly centering around ways of assisting safe capture. They questioned the qualification of our vet, Sig Rich, and I set them straight. While still on the phone I gave the order to procede. Everyone was tense, as can be imagined and chance after chance passed without results. Finally Tom noosed a big baby and the noose failed to slide back to the tail. Instead it hung up on the pectoral area (actually forward). Putting a head net on proved impossible because when we pulled on the first line it cast off head net. Finally I decided to haul him in on just the single line. We backed over near a sandbar and took the lines ashore. The mother repeatedly came up under the baby, rolling it out of the water on her side. It slithered over her, bent upside-down, sliding off on the opposite side. I was interested that the female seemed to take no note of the pulpit over her and continued to list the baby in response to the restraining line. There seemed some concerted or clear effort on her part to push against the baby and move to flail at the line or entangle it with her body or flukes. Her only regular movement was to raise the baby and to swim closely with it. Altogether a performance that did not indicate a remarkable intelligence and I must say this has seemed the case with each pair.

The evasive maneuvers of the whale are often quite effective, though they often fail when the animals get between us and the shore and they may surface beneath the plank. Though I have seen whales hit the prow of the *Louson*, I have yet to see them swing at her with their flukes. During capture a pair of adults circled the captive ([?] the mother), perhaps at closest 100 yards away.

Another thing we noted was that pairs (mother-young) tend to stay in a given piece of channel, perhaps 1/3 mile long and would usually turn at about the same place. Perhaps there is spacing and a spacing mechanism. Certainly the whales are relatively uniformly scattered though occasionally groups of 2-3 mother-young pairs will be seen. The male-female pairs seem oblivious and travel rapidly long distances up and down the channel past many mother-young pairs.

When the adult turned, which she could do with great flexibility, she often turned "wing down" with one pectoral. One could often note an incipient turn when she threw her flukes by a canting of the flukes, even if slight.

We had a helluva time hauling the baby in. It was extremely strong and the single line hampered us. She all but took about six men out to sea, line and all, but the rest came in as we horsed the animal, a male, onto the beach. Harnessing was tough since the animal was very big. But after 25 minutes it was done and the animal was launched back to the waiting mother, its instrument ticking away. They swam north at a good pace, crossing through several mother-young areas and finally we passed them, picking up fine signals on the direction finder.

On shore we looked for Dr. Bernardo Villa and Luis Fleischer his assistant who were to join us but they had not come. After dinner, however, they arrived, Mr. Sereno of the cannery having brought them in from La Paz, most graciously. He is perhaps Mexico's leading mammalogist and has worked on animals from bats to mountain sheep, and now whales. He proved to be a gracious, bright man, and we reckoned we had seen one another at various meetings.

Talk, readying of gear, and to bed. Tired, but pleased. I had a nice reassuring phone call to Phylly this evening tonight and it was wonderful to hear her voice, even if it did sound fuzzy over the radio. To bed.

(The previous notes hardly portray the complications we have been going through. Bob Goodman and I knew when we called Washington DC and especially Mexico City that we were unlocking Pandora's Box. These bureaucracies would be required to respond and only the attached letter could save us or review would come from National Marine Fisheries Service, the state Department (heaven help us), the environmental groups (heaven help us), the US Marine Mammal Commission (we're OK there), NASA (an incredibly goosey organization, afraid of its own shadow, conditioned I think by the long ordeal of keeping astronauts alive). Hinging on the outcome is not only our own program but much other marine mammal research, NASA Ames Animal Tracking Program, the fate of the animal tracking satellite, and more. Complicated beyond belief it is.)

February 2, 1974

Lopez Mateos, Baja California del Sur, Mexico

Well, what a day! Part real insight, part catastrophe and seldom down to the level trod by the common man. It started like most days with early morning arousal, breakfast,

the trek to the beach, shouts to the *Louison* lying at anchor offshore and shortly Boyd Reber jumping in the skiff to bring us aboard. Our party is swelled by two—Dr. Bernardo Villa and one of his students, Luis Fleischer, a young lad who wants to study marine mammals. The boat is, to say the least, crowded. This whale project attracts hangers-on like flies.

We turned south down the channel full of high hopes now that our agencies had told us to procede that we could quickly complete our work. A call to the Ames Lab set us back whe we learned that insufficient information for the head people was causing consternation there and the writing of a telegram (which had not been sent) cancelling NASA participation. It is thought that our letter did not go through channels but was suppressed somewhere along the line. Meanwhile we're supposed to get our work done. The animal we tagged earlier ticks along nicely and is located deep in the channel near Colina Coyote somewhere.

We made eight chases today and caught one animal which truly can be said the to have caught us. I'll not outline each chase.

A baby was noosed and again the noose did not slip to the tail but stayed around the pectorals. It was accompanied by a large, barnacle-encrusted female? and shortly by another. They were the most violent consorts we had yet encountered thrashing their tails and rolling over, supporting the baby partly out of water repeatedly. This baby, mind you, may weigh 2,000-4,000 or more pounds.

Tim cursed and finally decided to try the head net. Rog and Pat brought the line in while Bill in the crow's nest inched the vessel toward the flailing thrashing trio. Dangerous business indeed. As the huge creatures were brought under the plank, their 35-ton bulls rising to about eight ft. below Tim's feet (and mine as I was at the base of the plank). I could see that often their huge flanks reached the stern post directly below me. In the murk the flukes were lined by the white-pattern splotches and barnacles. Suddenly one flailed sideways, sending a sheet of water over all of us at the bow. Tim maintained his cool and tried again, this time placing the head net. Line was slacked and the animals moved off 50 yards or so. Suddenly we saw one adult heave its body into an incredibly powerful thrash of her tail, baby on top. The baby flew completely free of the water, broken head net flying free. Incredible, and thank goodness she chose to do it away from the boat.

Before this occurred I spent some time trying to understand the assistance behavior of the two adults. Often the two adults, which I guess were both large females, swam parallel to one another. At time one or the other supported the baby. A fair proportion of the time the adults had the baby between them and sometimes held it largely out of water as they swam along. But, equally often the baby swam outboard of one adult or the other. The lifting behavior continued even when the vessel lay some distance away quietly. It was also noted to continue after the ropes and nets were thrown off. It was strangely stereotyped behavior, to me, as if the reaction to fear or fright was only lifting, flight, and lateral tail lashing with no evident directed behavior toward the source of irritations, even when their tails touched our stern post. In short, these [?] show none of the obvious flexibility I see so often in odontocetes.

The body noose, of braided nylon, is incredibly strong, 20 tons or so [?] Yet it came in, broken. In looking at the line we found it frayed in many places and I feel it was cut on the mother's barnacles as it stretched over her heaving body.

Our last “capture” of the day began in Big Bay, not far from Colina Coyote. At 1433 we started to chase and nearly collided with mother and young, as they surfaced under the tow. Bill frantically backed the *Louson* away. 23 minutes later the first rope was slipped on and this time slipped to the tail. At once the attendant female disappeared. Now we were faced with a dilemma. If we took the animal ashore and harnessed it, and released it with no mother in attendance it would surely die and our harness would be blamed for the failure. It behooved us to free the baby if we could. That should be no trouble we thought, but the baby promptly presented us with an insoluble dilemma. It began to treat us as mother. It nuzzled the boat from stern to stern, especially under the stern and at about amidships where it often rolled close alongside the ship and parallel with it! It seemed to orient to the overboard discharges that were flowing from the engines that were flowing from the engines and presumably warmer than the surrounding water. It scratched itself repeatedly on zincs and other hull fittings and the tail rope had lacerated it. It also wrapped its line around the screw which turned slowly in the tidal current, we now being at anchor.

Shortly we cut it loose completely, hoping to release it and send a diver down to free the screw. That proved much easier said than done since, though free, it refused to leave. Once it rolled over and I could see it was a male. We poked at it with broomsticks, banging pans and shoved it away as hard as we could but to no avail. Then the anchor began slipping and we came closer and closer to the sand bar shore. Roger volunteered to dive in to release the line. Keeping a weather eye out for baby who could seriously injure him without intending to, Rog released the rope, having to come aboard twice when the baby slid aft. Now free we still couldn't maneuver for fear of cutting the baby. Finally after much indecision Tim gave Boyd the anchor line in the skiff and backed out into the bay when the baby went astern. It followed us like a puppy dog.

Finally Tim saw his chance, swinging the helm over and hit flank speed for open water. Soon we could see it plunging along in our wake.

Later the second animal was successfully noosed. It was a fairly large young with a small female. The noose slipped nicely to the tail but soon we noticed that the female was gone. No sign of her at all, almost from the moment of noosing. Here was a dilemma! Should we harness? If so the mother might not return and the baby might die. A dead baby with a harness was more than we could contemplate, not to mention our concerns for the animal. Then the baby adopted us—coming alongside and refusing to leave, pressing its whole body against the hull of the *Louson*. Shortly the baby took up station astern and even though by this time we were anchored the tidal current turned the screw and soon the line had wrapped around the screw. After some palaver I asked Tim to cut the baby loose in hopes that it would swim away and we could send a diver down to unwrap the screw. No such luck. The baby stuck to us with uncommon tenacity, often under the stern scraping itself on the zincs and drawing blood, which caused additional concern.

Then we noted the anchor dragging and the *Louson* sliding toward a not-too-distant mudflat. Roger volunteered to work on the line if we could devise a way of keeping baby away. Shortly we found we could alert him in the water if the baby began to move aft. He submerged, found five or six wraps around the screw, and in two tries (with time out for baby who had temporarily slipped astern) he undid us. The concern was not [?] but simply bulk and weight which might pin Rog beneath the hull.

Then Tim backed away from the baby, first loosening the anchor line and tossing it to Boyd in the skiff. The baby followed like a puppy and we feared mightily that it would get cut in the screw. But he made it and in deeper water was able to turn and head offshore. Soon baby blew and pursued us far[?] in our wake. Paul and I watched the little waif anxiously, hoping to see an adult. Joy! Joy! One came up and headed for the baby. I thought I could discern it to be the mother—small, smooth, dark. With this hope we headed up-channel to Lopez Mateos, having had enough for one day.

Feb 3-6?

I had to leave to teach at UCSC and so appointed Roger my successor (knowing that Larry would quietly react against this, but also knowing that Larry was a new grad student while Rog was a Ph.D. and an experienced field man and especially knowing that Larry was busy fighting, identifying problems of his own). I briefed Roger on how he should cooperate on decisions with Bob Goodman and with Dr. Villa.

Next morning before dawn I walked down the dusty Lopez Mateos street wearing my duffle bag, took the Camionetta for Villa Constitucion and a bus to La Paz, then the afternoon flight out to San Francisco.

At home there followed three days of lectures, phone calls to officials and reporters and finally a crackling indistinct call from Roger informing me that the *Louson* had been lost and a request that I come down Thursday for a board of review on the loss. I quickly made my plans to do so, in the company of Dave Winter of NASA Ames (Deputy Administrator, Life Sciences) who had to make an on-site review of the animal death.

Here is what I found. After I had left, the next day the crew caught another animal, this time a hulking beast of 19 ft. All went well as it came in, noosed head and tail, with respiration data being obtained and the animal launched back quickly because mother seemed to be wandering. They quickly rejoined and swam off, the animal being dubbed Patti. Meanwhile Knute (the other) stayed near Colina Coyote. Not long after (10 hrs) Patti passed the anchored *Louson* at Lopez Mateos and headed for Boca Soledad. The pair of animals went through the Boca and headed south! Some of the crew were able to track them across the dunes using the hand-held direction-finder. Then they were gone. Not long after, Knute and mother came up channel and were sighted swimming well. The harness and packs seemed to have no effect on either respiration or swimming motion. There was no yawning or rapid respiration.

The pair passed the *Louson* at night, forward and perhaps into the Boca and then came back making a long traverse down channel, and then back again. They moved out into the Boca with the *Louson* following. At this time the beeps from the radio were intermittent, indicating that the harness was still on the animal and that it was diving. Once signals were far out in the Boca they became constant, indicating that the whale had finally shed its harness (it was very late, the bolt should have eroded away many hours earlier).

The *Louson* followed. The entrance to the Boca takes a dogleg south, as do the whales who follow the deep water channel which is as much as 60 ft. deep in its inner portions. At about the turn in the dogleg the ship stayed close to shoal water and with a great thump hit a bar, spinning the ship around and causing her to heel sharply over. People slid and so forth. Gasoline drums (unlashed) skidded across the afterdeck. Two

men in the crow's nest (Jerry Koozman, Pat) hung on for dear life and then came down. The wheel house was a melee, though the ship seemed capable of inching off (they were perhaps 50 ft. inside the shoal area, adjacent to deep water, and maybe a mile offshore). People loaded into the whaler. Tom with all cameras held above spray. Soon everyone but the crew and Rog were ashore on the south bar.

It was decided to send Dr. Villa in for help since he not only had a commanding presence but, of course, spoke excellent spanish. Pat took him in the skiff and for some inexplicable reason started off full tilt out through the breaking 5-6 ft. surf. Dr. Villa was thrown against the wheel console causing a very deep bruise, and against his sternum which may have suffered a separation or crack. He lay crumpled in the bow while Pat leapt out and ashore and ran down the beach like one deranged, which I guess he was. Boyd, on the other hand, when he had come down from the spreaders after the initial beaching commented to Tim, "Hey Commander, that was a psychedelic experience!" and thereafter functioned well.

Paul instantly spotted the doctor's problem and quickly went to the skiff, grasping the bow as it rose up and down with each wave. Jerry Koozman joined him moments later and together they controled the skiff and brought it around to safety and finally to Lopez Mateos. There they found a fiesta day with ships crews away at Villa Constitucion and a bull fight. It was the same everywhere. No help. The *Island Eagle*, which lay at anchor almost refused to let them phone. Meanwhile, on the boat, Rog and Tim, Boyd, and John tried to kedge the ship loose and could only swing it part way. Nothing seemed to work. They had hit near hightide and now it began to drop. The boat began to pound[?] and sometime later the keel started to fragment, pieces floating away. Then the screw pounded through into the hatch and it began to fill and heel over. They knew they had to leave. At first they went on the anchor rope but could hardly stand (waist deep) against the current. Tim went aboard and they inflated the life raft and made it early to shore when they were picked up by a skiff and brought ashore. That night the sea pounded the *Louson*, rolled her over, taking off most of the flying bridge, splintering masts, ruining all electronic and other gear. The sad, sad sight of her hull, half capsized deep in the bay greeted the crew next morning. Tim, needless to say, is deeply shocked and almost speechless over the incident. When I met him two days later, he was still ashen and his palm moist when I shook it. Poor guy, so much tied up in the *Louson* and such a beautiful ship.

Later Tom and Larry walked the beaches in search of the harness so we could hope to recover something from the trip. Near the mouth entrance of the Boca they found Knute, buried deep in the sand with little but the antenna protruding. The harness had filled with sand and could not float—a misfortune we had not thought of. Inside the capsule, however, the recorder ticked away as usual, quite dry and with data intact. That recovery is enough, providing the tape holds data, justifying the cruise scientifically along with Jerry's observations on respiration, but, of course, nothing can recoup the *Louson*.

My trip down with Winter was a good one. He is a bright driving administrator who knows his agency has responded irrationally and who will seek to redress the problem. We traveled to Lopez Mateos by car and spent a day reviewing safety procedures and remedies. He is thoroughly on our side, and I find he may be the NASA choice to head the entire NASA biology program with the recent retirement of Dr. Charles

Berry. That would be something as we would now, I feel sure, have a personal friend in court. Dr. Villa, too, turned out to be a remarkable man and one quite committed to what we hope to do. He is a real patron (called Maestro by his students), a deeply human man, obviously deeply respected by everyone who knows him, who has called for and gotten national parks started, including one, I find, at Sierra San Pedro Martir, and is working on another in the Sierra Pinacate in northern Sonora. A gallant and fine man. I hope we can work together. He seems to want the relationship.

Well, there's much to do for next year but I think we can go ahead with some hope of eventual success.

[Journal a bit out of order for this trip—here are some bits that I couldn't figure out where they went!]

I felt terribly apprehensive for that little animal, hoping that in the narrow confines of this channel system mother would not be far away. I watched the baby with binoculars and could see surface and blow now and then. Finally, much to my joy, an adult surfaced near it and swam directly toward it. I could almost be sure it was the mother by the smooth dark unmarked back and now I'm at least reasonably sure they are together.

Again notions about these creatures orienting tactilely are greatly strengthened and the idea that a baby when it refuses to leave the beach, is involved in fulfilling a need for touching of surfaces. In the murk of this lagoon (visibility is near 1-2 ft.) the baby and adult never see all of each other but must touch instead.

This was enough. Everyone was emotionally, if not physically bushed, so we turned for Lopez Mateos and discussed the multiple frustrations and views of these remarkable animals. I was very pleased that Sr. Villa seemed only very interested in our progress and not condemnatory for the disturbance we caused. I was, however, given pause on this score should we not be able to refine our techniques to produce a less disturbing set of events.

Back at camp I turned the reins over to Roger and tried to patch up some of the irritations that seem inevitably to build up in an effort of this sort.

Whale Tracking, Baja California, Mexico, January 19-February 10, 1975

January 19, 1975

La Paz, Baja California del Sur, Mexico

Phylly and I drove to UCSC where Patty and Tom met us and drove to San Jose. The airport was fogged in but clear skies were less than a mile away so we had hope. About half an hour late we took off, transferring at Los Angeles. There PSA succeeded in losing our pop-up tent which I had spent hours yesterday repairing. No idea if we will get it or not.

The Aeronaves plane took us right down the spine of Baja. We could see San Martin Island, Geronimo, the various bays, Cedros Island, Scammon's, La Purissima arroyo and then the clouds closed in and by the time we landed the rain was dampening the field. Bernardo Villo and his son-in-law, William Lopez-Gormont were there, having arrived a couple of days ahead of schedule. They had been following bulldozers catching reptiles and small mammals up on the Magdalena Plain. William said the draw down on

the fossil water of the Magdalena Plain was about 2x restitution so people were talking of a “future ghost town” at Villa Constitucion in 15 years. Nonetheless they continue to clear land using a chain and two d9 caterpillar tractors. We stashed ourselves at the La Perla (as usual they had paid no attention to our reservations). Next time I’ll try the “Los Arcos” down the street.

We had a nice dinner at the Tepepan fish restaurant on the shore—delicious sopa mariscos, pesca mojo de ajo, and good chilled chenin blanc from Santo Tomas vineyard in northern Baja.

Tomorrow we try to retrieve the tent before the bus goes, and take off for Villa Constitucion. George Nichols joined us at the La Perla and because he sports an elegant white beard I was instantly aware that we had Dr. Van Denburgh with us. Prior to that I had thought that a negro fellow with a partially gray but very short beard in the LA airport was him. I was bothered by him. Tom said it was “equal opportunity.” George, however, is just right, though trimmer and neater than most Dr. VanDenburghs of my acquaintance.

January 20, 1975

San Carlos, Baja California del Sur, Mexico

Up at 7 AM after a fitful night on the swayback La Perla mattress, plus entertainment from some borrachos breaking bottles and revving their engines. No tent. So we decided to leave William and Tom in La Paz to check it out.

A nice sleepy drive to Villa Constitucion, which has grown about 5,000 people since we were here last year. Lots of new cement buildings are dotted about—a new post office, telegraph microwave relay, and others. Lunch and a haircut and then back to the station where we met Larry Hobbs, Candy Calloway, and Dick Pierce. They had had a good uneventful trip down. We then left for San Carlos to make camp adjacent to a big fish packing plant of the Pancho Compania. Bernardo had arranged it so we were inside a locked gate.

Some of the local fishermen report that gray whales feed on sardines in Magdalena Bay. One reported whales following the fish schools and another told us fish were harder to find while the whales were here. They fish inside the bay. Not conclusive but I’m inclined to think it might be true to some limited extent.

Our camp was soon shrouded in fog and Phyl and I spent a drippy night in the open.

January 21, 1975

San Carlos, Baja California del Sur, Mexico

Up at 7 or so, coffee, granola, packing. The truck left while Bernardo, Phyl, George, William, and I went to see the Capitan del Puerto, Sr. Armas. Everything seems fine there, providing our ship papers are in order. We looked at the pier, watched ospreys carrying sticks to their nests, and perched on a monument waiting for our truck to come back. We properly thanked our host at the plant. Desultory talk in the sun of this and that, wondering when we might get lunch or leave to set up camp at Colina Coyote. I hope we make it before nightfall, and get going on the whale watch.

San Carlos is set on a low peninsula jutting southward into Magdalena Bay. It’s a mixture of helter-skelter shanties and clean modern factory (fish processing) buildings,

ammonia tanks (for a fertilizer plant), broad cotton and wheat piers and clean new port buildings. Sr. Armas, the port captain, is an affable, bright man whom we were delighted to find had kicked the *American Eagle* out of Baja California. She was the boat who refused to lend the *Louson* help when she sank.

Finally, Dick came in the truck and we piled in for Villa Constitucion. There we bought gas and beer and left for Lopez Mateos. It's a long way, mostly over a good desert road and we arrived near dusk to find Candy on the beach perched on a pile of gear waiting for the boat. It took on the order of two hours per run when the boat was loaded—Larry figured it at 10 miles. In the fading light Larry showed up and we quickly loaded about half our gear (leaving the rest in the truck behind Sr. Serrano's house). It was a lovely ride down the channel, first in last light and finally in the dark. We found Tom's light back in the little bay (Caleta Calloway) N. of Colina Coyote. We pulled in to a lane through the low (6 ft.) red mangroves, unloaded through the muck and set up camp on a level pickleweed flat just behind the mangroves. Phylly, William, Bernardo, and I assailed our pup tent—a contraption of fiberglass wands and canvas that defied us all. I developed a "General Field Theory of Pup Tents" that had us snarled in duck decoy cord but resulted in an asymmetrical precarious looking structures that kept out the ground fog that rose later and flooded over the camp.

A good meal, a fire of mangrove driftwood (elegant coals), desultory conversation, and off to bed, with coyotes yipping nearby. Wonderful music for the camp.

January 22, 1975

Colina Coyote, Baja California del Sur, Mexico

Before breakfast I walked over to the Colina. Whales cruised lazily in the channel, each with a young animal alongside, the usual dense flock of godwits and willets perched on the beach below the Colina (Playa de los Norris). I decided to move camp closer so that we could observe more easily and frequently. Proximity and chance observation play, I find, an important part in animal observation. This was certainly the reason we learned so little while staying at the cannery and here we were 800 yards back from the beach. So we moved the whole shebang to a little sandhill at the base of the Colina on the north. Just above the highest tide strand mark there were still many small crab burrows in the sand amid the low *Croton* and *Astragalus* cover. A solenaceous shrub whose name escapes me (*Lycium*) was the biggest plant. Also common were a low *Atriplex*, a succulent, a long thin *Oenothera* in bloom, *Distichlis*, and a pretty yellow *Solanum*?

Our camp was set behind a hill about 30 yards in from the beach to minimize our disturbance of the whales. I set the tents with their backs to the wind and circled the camp with cooking tables to the south (plywood half sheets on supply 5-gallon cans). A ice camp. Back of us to the west lay a gently rolling flat that ended half a mile away against the beach dunes of the coastal strand. At night the breakers boomed in continuously, not being very evident during the day (sound conducted in vapor and reflected or channelled in an air layer, or is it wind?). Now we have a short hike up the colina and just up the sand hill by camp we can see and hear whales.

We set the watch and began observations. At first there was some confusion because I asked for too much information. We settled (mostly with Candy's advice) on

tracking and animal identification during watch and more detailed behavior otherwise. When off official watch, I'll collate after the trip and provide everyone with copies.

We were able to make the first steps. Most animals concentrated in certain areas, in areas where the animals stayed still, there was more fluking, spying out, rolling, and throwing of the pectorals. There was evidence of some reaction between adult females at times and no large aggregations. Once a female with calf came up channel from Devil's Bend, encountered another pair at Hobbs Channel (off Cabo Forment), and abruptly turned back south from the point of encounter. We noted that spouts were ubiquitous in the cool morning air but only evident sporadically in the hot afternoon. Obviously condensation is involved. So far we have been unable to see nursing though occasionally we see young at right angles to an adult at about the level of the first knuckle on the back, or over the urogenital area. So far we have not seen young wander far from adults, though often enough the adult will be down below the water for some time and the young will surface above. Adults, especially, will often spend long periods on the surface with the mid-back exposed, sometimes over 20 minutes. At the end of such a session they typically raise the snout, breathe and roll under, often to reappear and lie again.

Phylly took a hike out across the sand to the ocean beach where she reported there were whale bones, sea lion skulls, turtles, sand dollars, sea fans, and acres of shells. Obviously a good hike over there is in order.

Around the fire we discussed many things. Bernardo told us of Dr. Isaac Ochoterena the founder of the Univ. Mexico Institute of Biology, whom E. Raymond Hall called "the handsome Aztec," who went in the field with button sleeves, spats, a waistcoat, and tie and who asked his assistant to collect this or that plant or lizard.

George told us about the famous Dr. Van Gahn, who watches over pathologists—pinstripe suit, french cuffs. When doing an autopsy he rolled his french cuffs back two rolls and dove in sans gloves. He watches the group now as a spirit. Little does George know that we suspect he is presently carrying the spirit of Dr. Van Denburgh, the patron saint of collecting trips, since the good Dr. normally occupies the body of a white-bearded gentleman.

Off to bed, with air mattress supposedly fixed. Alas it leaked again.

January 23, 1975

Colina Coyote

Things are falling together, piece by piece as they do with behavioral observation. We've seen feeding or at least grubbing in the bottom with the mouth and very likely nursing plus much other behavior.

We have begun to realize that spying out is very localized and we have only seen it between Cabo Forment and the S. end of Isla Villa, in the channel. There we have repeatedly seen it.

While I was watching Animal #1 and her baby I saw the adult emerge snout first in a boil of mud, then moments later saw the same animal dive and emerge with a cascade of very muddy water pouring from the corner of the mouth. The mouth was slightly open.

Later we saw the same adult emerge and clean water cascade out in the same way.

George and Phylly describe "nursing behavior" as follows, and I have also seen much the same action. The adult female rolls lazily at the surface, often throwing one

fluke out of the water partway. The baby, standing off to one side nearly at right angles to her belly at about the vent, rams or thrusts against her and 10-20 seconds later rises to the surface for a breath. We have not seen milk or have we been able to see details because of the angle of vision.

Well, the motor quit when we sent the skiff in to Lopez Mateos for bread and the rest of our gear. It just stopped. Oh my! Fortunately we have a going home motor—a little six-horse seagull. Tom and Dick were out in her and the sonarbuoy they were trying to place over near the Canal Hobbs (MOCHO). It sank. The saltwater corrosible bolt leaked where it had been epoxied. Blup, blup down it went! Oh, woe! They tried to work on the motor and found aluminum on one spark plug. It's a new 65-hp. Merc and is probably having break-in troubles. For a while we thought it had a broken piston. But she turns over hard hence isn't frozen. Well, now what? I thought it over and decided we had to move it on fixing the problem tomorrow so if we do have trouble there will be time to get around it. So I'll send Larry and William off to see what they can do—fix it, rent a motor boat, or fix the engine in Villa Constitucion. William will translate and Larry will make the decisions about what needs to be done.

I'm sure Tom and Dick want to go, but I'd rather leave the logistics to Larry who has planned everything so far, and dove very well, too. I've probably affronted them a little but I have to decide how to handle things. So I do it. Dinner and off to bed in the cold air. We don't even have fog now—just snapping stars.

January 24, 1975

Colina Coyote

Today Larry and William go off to Lopez Mateos. Meanwhile, Phylly and Candy will stay in camp to measure respirations and dive times. The rest of us are off to the ocean coast to walk for osteologic specimens. Off we went across the flats to the dunes. We passed a couple of Baja jackrabbits, their ears up and their posture poised for a leaping run through the low vegetation. Bernardo and I had a chance to talk. He is a dignified yet humorous person, very gentle, yet full of resolve, especially when his country is involved. He is a master of concern for other people, always polite and a biologist to the core. He has known most of the old masters—Hall, Grinnell, VanDenberg, Klauber, Cain[?], and so forth. Obviously his skills have placed him high—head of his country's park service, head of his Department invited to head the Univ. of Puebla and other things. A fine man in all ways. William with him is young, bright, in good command of his field, perhaps a little unwilling to go out on his own, a little brash. I like him very much. He will, I think, go far. We swap plant names, being supported by our mutual lack of precise knowledge.

Over the barrier dunes we went. In the hollows were fields of land snail shells, all arrayed in a spaced fashion. I thought I could discern rows, probably based on underlying wind ripples. I suspect these light shells blow away from one another and hence space. In many cases each had a little sand shadow trailing it. Striking.

We emerged onto the beach—a 150-yard-wide with tiers of low breakers piled offshore. Beyond, out in the band of blue sea we saw whale spouts. One group moved south, as did three small seiners, obviously making for Punta Entrada.

The pickings were good. Along the scalloped upper beach were regular passes through the dunes, each filled with shells, detritus, and bones. We picked up about six sea

lion skulls, a *Tursiops* and two *Delphinus* of the long-snouted variety. We walked quite a long way, watched the truck drive by from Pt. San Jazaro—on as smooth a road as any in the world. It usually carries lobsters but this time it was the fish truck.

Far down the beach I called a halt for lunch and the turn around. Gauging the state of my feet I decided I'd be worn out by the time we returned to camp. I found Bernardo concurring. We lolled on a beach-edge dune, talked and ate our bread, dates, and fruit. On the ocean in front of us a group of whales moved south and two small seiners went by, headed for Cabo San Lazaro.

Trudging back up the beach we picked up the specimens and poked along. Bernardo had picked up a boat hull[?], George a gray whale rib, Tom a long bamboo pole, and others various items dangling here and there. The day was very pleasant and clear but we were sweating before we reached camp.

I went fishing and caught a *Menticirrhus* and some small mojarras. The tide was coming in, the moon beginning to shine when things got too cold for my thin shirt. Candy and Phyl had spent a frustrating observation day since all the whales had left at low tide and never did return. They were taking respirations and dive times. Toward evening Larry and William returned using a rented motor that pushed them along at something less than flank speed. Apparently the Mercury can't be repaired here with any security so Larry wisely decided to leave its repair till we get back.

January 25, 1975

Isla Magdalena at Colina Coyote, Baja California del Sur, Mexico

Today I plan to try to typify in words various movements and behaviors of whale adults and calves in the lagoon Tom and Larry will try for some recordings and the others will carry out the behavior sheets. It's a lovely clear day, temperature about 65 degrees F. and a slight breeze from the north. Coyotes yip in the morning air from an adjacent low swell of terrain 500 yards away, and two Magdalena jack rabbits hop in the flats nearby. A beautiful flight of white ibis soared in low over Caleta Calloway and settled in the pickleweed flat 800 yards away. Behind me in the channel I can hear the occasional sibilant deep respirations of whales.

I forgot—Dick picked up two bottles yesterday with notes in them. One was from Bunny and Burl who had emptied a vodka bottle on a cruise ship out of Mazatlan and would just love to hear from whoever picked it up. Burl, they noted, was the humorist of the group. One could almost see the lampshade.

The second was more somber, scrawled in red pencil across the corner of a sheet of paper in red pencil. It said. "Help! I want aground on a Island San Roka "I think." Please send Help Fast. Allmost out of Food and Water. Please send to Coast Guard Fast.—Mike Tiama"

There was no date and the bottle was high in among the dunes. The paper had a pinkish suffusion as if moisture had made the pencil run.

Typifications—respiration adult (Sancha). Adults sometimes breathe with nostrils just barely above the water. The adults straighten back slightly, usually causing a slight upward movement of the head. The nostrils swell before breath is released.

Sometimes breaths are released below water by both mother and young.

The spout is double just at base and merges upward into a single “mushy spout.” With any amount of forward motion respiration doesn’t seem to interrupt the motion. When floating, often the rearing up will cause the adult to slide backward slightly.

The baby typically rears up, throwing the head free of the water often without the body aft of the pectorals showing at all. The head sometimes is free of the water, exposing even the lower jaw. There is very evident arching of the back in the baby, just behind the head, thus throwing the head upward.

There is some contribution to the blow from water around the nostrils. When an animal rises rapidly from the water and immediately blows one can see the force of the air “tearing the water pooled on the nostrils [?] into the blow.” Most of the pooled water seems to contribute to the low part of the blow while the vapor column from within the animal goes upward farther.

Whales can blow without a spout. They do so when they rise slowly and blow leisurely without force. Thus the presence or absence of a spout is seemingly related to velocity of exhalation, hence a pressure gradient.

Spouts are almost ubiquitous in the early morning air when the thermal differences are greatest and dewpoint lowest.

Thigmotaxis: There is a remarkable degree of body contact between mother and young. I think I can see it solicited by both partners, especially by the young. The young animal will slide all over the mother from her head to her tailstock. The baby will roll over the female’s back, rotating onto its side and back and throwing its pectorals into the air. The mother responds by pressing up against the baby, sometimes pushing it half into the air, with it lying across her limply. We have seen baby’s being carried on the dorsal surface of the flukes of the mother. What is use of thigmotaxis? Some whales apparently go south, though most go north here.

Tides: Once again, for the 3rd day in a row the animals have begun to move out of the Devil’s Bend-Canal Central area forward of Bahia Grande. In all our observation time animals never seem to have moved over tidal flats, but instead stay in the permanent water, often at the very edges of channels. In fact much of the movement and activity seems to be along such drop offs.

The exodus occurs well before there is much reduction in water level, in other words apparently in relation to water flow rather than depth. Today’s movement began when water was up into the bases of the mangroves, or in other words very near high tide. The exodus is leisurely, a slow movement northward, accompanied by periods of floating, thigmotaxis, spying out but generally to the north. There usually are some concerted bursts of slow purposeful swimming.

Reactions between whales: Except for a few groups of threes, adults or pairs involved in chases, whales seem quite solitary, even spaced. The spacing results, I believe, from a low level of avoidance at close range between females with young. We have seen cases where females approached each other—one approached within 10-25 yards of the other and one turned 180 degrees and retreated back down channel. In another case two animals swimming head-on at the very edge of the channel met. One continued on track (the outboard animal) and the other veered in over the tidal flat about 20 yards from the drop off. Because I could just see the flat I’d guess she was in eight ft. of water. This is the only time I have seen an animal out of permanent channel.

[Drawing]

Spying out: Spyng out has all been concentrated at the mouth of Hobbs Channel between Isla Villa and Punta Forment halfway down Punta Forment or halfway down Isla Pierce to the south of Cabo Forment along Isla Pierce, in both cases mostly along the edge of the dropoff. Adults do most of the behavior though babies do rear out on occasion. The animals here have seldom risen above the pectorals. They often rotate slowly as they rise, often emerge upside down and often at 10-20 degrees from vertical but never, in my observations, more. The jaws of the animals seem often slightly agape, though usually closed.

When mother submerges the baby usually goes with her though sometimes one will see a baby at the surface alone for brief times.

In the areas where spy outs occur there is also the most pronounced underwater behavior. One can often see underwater blows, circling by tail beats underwater, and much stationing at given spots. Animals also return to the special spots after tidal currents have drifted them away. One animal has stationed for nearly two hours in one spot by Isla Pierce.

Nearly all spy outs are unaccompanied by mud. Only in three cases out of perhaps 100 examples have I seen mud.

When boat and seagull turned on and left for recording three adults with young were in view. One pair turned in off tip of Isla Villa, turned on speed and ran up along the drop off. These animals were 500 yds. from the boat to the S. off Isla Villa. 2,000 yards S. off Isla Pierce a whale moved away into deeper water. She had positioned for about 2½ hrs. and then 4-5 minutes later, began to move N. resolutely. Our channel is almost swept of whales.

January 26, 1975

Colina Coyote

Last night a sailing ship came poking up Devil's Bend and came to anchor at the north end of Playa de los Norris. It was being ferried to Los Angeles for an [?] by a Swiss fellow, Peter Kittel. I was fishing off Caleta Calloway when he came walking down the beach. He was a whale freak, acquainted with the usual people and books.

About that time, as the tide approached high, whales began to come back into the area. One came in at flank speed pushing a bow wave that surged onto our beach. Two others were close together and I suspected that we had a male in the nursery. Every time we see adult "males"? in with females we have adult whale to adult whale proximity, chases, high-speed swimming, rolling and thrashing, and throwing of flukes. Phylly reports that in one adult to adult chase the baby became agitated, bobbing around the mother frantically.

I'm on top of Colina Coyote now with Bernardo, having relieved Phyl and George who had the early watch. Tom, Candy, and Larry are going to Matancitas with William to observe at the Boca and William will call Mexico City and get gas.

Now for some observations.

Spying out: here at Colina Coyote we have seen only two "breaches" in which the animal rose to the fin stock or a little less and fell back with a big splash. Otherwise we see spy outs, which are very different. In these the animal simply emerges slowly, snout first and rears up about to the level of the eyes and slowly subsides. Since it nearly

always occurs near the edge of the channel, it could well be that the animal has its tail on the bottom and is simply pushing upward.

#1 Spy out. Off Isla Pierce. Out to eyes with baby at surface, belly of mother toward bay, mother oriented belly down Canal Central. Slack water.

#2 Spy out. Off Isla Pierce at channel edge. Came up dorsal surface first and then subsided, belly up channel facing N.

Five pairs down channel in first part of Devil's Bend area. Last night I watched an animal spy out off Cabo Forment in the dark using Night Vision Scope. There was a partly full moon. I have seen a five-second spy out in Bahia Grande. Almost surely standing on tail and subsiding back in attitude from which it rose.

I saw one animal rear up smoothly and as it descended its path wavered which would seem most likely to indicate the animal's tail was on the bottom and that it exerted pressure against the bottom as it fell back.

I saw one up for 17 seconds. It first reared up almost straight then fell slowly foreward until just the tip of the snout was showing, reared up a little way again, and subsided. Figure a 40-ft. animal with 6 ft. of head out of the water and [?] of flukes and body and one would expect the water depth to be 28-30 ft. where they spy out. Where is the baby during spy outs? I see no baby in sight.

Then the whales went underwater and we saw them seldom again. We had a very low tide today watching the high of last night which flooded the pickleweed flat where we first camped. So it seems pretty sure that the exodus we have been seeing is a tidal phenomenon. The whales do leave, going N. into Bahia Grande.

As to place phenomenona in these whales there are some whales we see over and over but there are some that move in and are never seen again. Nonetheless the place where we see spying out is one area only.

But with conger[?] observation it has spread along a wider area—from about the tip of Isla Villa down along Isla Pierce a little below Colina Coyote. I suspect it may have something to do with the presence or absence of a cut bank and a deep channel adjacent to shore.

Bernardo and I ran a "short term" behavior record, mostly dealing with respiration rate and spying out. Momma spent a long time below water at first her longest drive being somewhat over seven minutes. Later she spent a 15-minute period reathing rather often. The calf breathed rather often through the whole sequence, and the pair swam together a fair distance—perhaps 1,000 yards, and one major course change was done by the female underwater. She kept within the chosen areas and made one directional decision underwater.

Tom, Larry, and Candy, and William went to Matancitas to phone and to Boca Soledad to watch whales there.

Meanwhile Phylly and I took a hike looking for coyote skulls for Bernardo and William. We went south behind Colina Coyote down to the lagoon to the south. We came up with two skulls, one a coyote and the other turned out to be a badger.

Bernardo was very pleased as he thought maybe there was no badger from this area. Then Dick and I went fishing up at Caleta Calloway. As we walked out on the sand spit a single *Tursiops* swam up along the rather sharply sloping sand beach. The porpoise swam in until he was rolled well onto his side. He made passes at fish within a few feet of us, eyed us up through the water, cruised or turned back in front of us again. This time a

fairly large stingray flapped out of the water at our feet onto the sand as the porpoise passed. The strategy was to trap fish in the wedge of water against the beach. The fish were then limited by shore, surface, and bottom, and could only turn back into the jaws of the porpoise. Few fish were to be had so we trudged back to camp and soon the skiff arrived. Dick had created a pineapple upside-down cake and some sort of stew. Much conversation and to bed. Tomorrow we go out in the little yacht off Isla Villa to see if we can see down into the water where the whales are most common.

January 27, 1975

Colina Coyote

It rained a little last night and in the mornig there were various reports about the integrity of tents. Bernardo's dripped at the ridge pole, Phyl's and mine leaked at the door, Tom's came in the triangular window, and George reported complete watertight integrity. No report issued from the cook, Dr. Pierce, or from Larry and Candy.

At about dawn Geore scurried around outside putting on coffee. At about 7:15 AM Peter Kittel came ashore and took us on board the Kris to observe whales from her [?] mast. We went across to the mouth of Canal Hobbs, anchored and drifted out. The tide was very high. For the first time whales moved over away from the channel we had occupied toward Colina Coyote. Peter put on more anchor line and drifted us out. All the animals were over along the Colina Coyote shore. Most animals were quite sensitive to our presence, moving away when they were 80 yards away or so. For two hours this was the pattern, and finally our decision was to move nearer the channel center. This move was spurred on by the fact that we had run lightly aground. A bit of tugging on the anchor and running the engine forward we broke face and proceeded to the new anchorage. Almost at once we had animals around us and this continued until the tide began to change and the animals moved northward out of the channel.

Many times the animals moved close to us, sometimes close enough to be seen underwater. Rather little of the behavior seemed new to us. We saw much contact between mother and young with the baby being lifted on the mother's head, or on the tail stock or flukes. Most of the time the baby stayed alongside the mother and parallel. It tended to follow her down in dives, though surfacing more often if he was staying below for long periods. At times the baby wandered a little—the farthest from the mother that I saw was about 50 yards with a quick return to momma. Mostly they stayed very close.

We saw more spying out, some from close up and I am more and more convinced it's done with the tail on the bottom and the nose levered upward by flexing the back. Candy believes she sees it more often when adult whales are close together. I think she's right. It also only hapens when the movement of the animals involved is very slow. Spy hopping or breaching is very different and occurs only when animals are active and we are beginning to wonder if it might be mostly or wholly by males. Breaches come in groups, just like spins, and the highest breach is usually first followed by less active ones, rather like an animal taking out its excess energy and gradually tiring.

Our breaching animal this morning did so in front of the Colina and Phyl says she was impressed how slim he was compared with others. I've wondered at how broad the backs of mother whales are behind the blowholes (over the ribs). It is so extreme when an animal surfaces near that I wonder if the animal is somehow dorsoventrally flattened in this area since I cannot believe they are that vast in diameter. Maybe the loose ribs and

lack of sternal attachments allow the ribs to spread under the pressure of buoyancy from the lungs. Stranded animals I have seen have not looked nearly so broad.

Nursing still eludes us and seems obvious to be carried out mostly underwater. On one occasion I saw a young lying at about 60-70 degrees from mother at about the level of her vent and as she submerged and bent her tail stock the baby dove under the stock of the mother and twisted its flukes in such a way just at the surface as to swim up under the mother. Nursing? I don't know. Dick suggests nursing might not be so frequent as we supposed it might—a few times a day would suffice and points out that the mother has to have time to manufacture milk in between nursings and to release it.

This afternoon we run soundings and record whale voices.

[Letter from Dr. Bernardo Villa]

Reading the notes around the fire caused good discussion. How much body out of water? How high does a resting whale rise above the water. In other words, how much buoyancy is involved to counterbalance the weight of the animal above water when the animal is floating?

Larry describes a floating animal blow and then go down a few inches and then bob above median level, fluctuate four times approximately before coming to stability. Phylly describes an animal lying on the surface, flukes came up on the surface and all knuckles showing and then a lateral S-shape curve with flukes in original orientation to body. Dick describes animals blowing underwater and staying down, suggests this should increase density and sink.

I've seen underwater blows not followed by a surfacing until a minute or more later. Some animals float higher than others, some are nostrils only above water, others are fairly high. Indicates some flexibility in inspired air.

George tells me that when fats are cycled, triglycerides cycle under influence of epinephrine and fatty acids are often reused while glycerol is always made and releases heat, hence whales may in effect may be encased in an "electric blanket."

January 28, 1975

Colina Coyote, Isla Magdalena, Baja California del Sur, Mexico

This morning some folks will be preparing to break camp tomorrow, some doing the last checks on the scars and marks atlas. George, Tom, Bernardo, and I went up into Bahia Grande to try some recordings. The wind chose this time to blow and the chop made recording in mid-bay pretty unworkable. Two differences in behavior struck me—we saw some spyouts and each time the animal fell back rather than subsided. Bahia Grande has water 40 ft. deep or so and I suspect these animals were not touching bottom.

Second, we saw animals invert and throw their tails out, perhaps 10 ft. of the animal was in the air with the flukes waving. The slow subsidence suggested its snout was on the bottom.

January 29, 1975

San Carlos

Today is moving day and quite a day it has been too. Up at dawn packing tents and cooking gear with one hand balancing a cup of coffee and a bowl of granola. The tide was high and still coming in. By nine we had loaded the skiff under blustery clouded skies with intermittent rain falling, and George, Dick, Larry, Bernardo, and I had climbed

aboard. The rented outboard pushed us along modestly well, though we bucked a very strong flooding tidal current and it took us two hours to make Matanatas. We cruised up along the dunes, peering in amongst them at ever turn. One coyote slid along and climbed a dune not far away and we came across an adult and fat sea lion sitting on the sand bar, all alone. She may have been ill but was well enough to launch herself into the water. The tide flooded very high into the reentrants and the dunes by the time we landed.

We unloaded and filled the truck leaving Larry to start back for the next load. Not long after we started for Villa Constitucion. Larry's motors quit and he limped back to the dock. Then followed a long saga in which Larry finally located a boat and motor and returned to camp and at 4:30 left in the rain with this boat and another that had showed up. Phylly and Candy, William, Tom, and Larry piled in and after a long time landed at Lopez Mateos where Dick Pierce and Bart Gordon were waiting with cars.

Meanwhile we had set up camp at San Carlos on a sandy flat back of the beach north of town. George and I concocted a fine dinner that aside from us, went begging for several hours.

We had met Sig Rich, John Hall, Bart Gordon, Jerry Koozman, his two technicians, Krupe of San Francisco State (interested in cyamid parasites) and his two friends. Quite a crowd. It's amazing how this operation attracts people and how many more would have come if I hadn't turned them away. I think gopher-watching would be more peaceful. We've a good crew though, especially our field party has pulled together into a well-functioning group. Certainly yesterday through all the troubles of rain, motors, loading at low tide when you had to be carried out over a long mudflat—everyone has worked together. Phyl, who wasn't feeling too well, apparently worked like a trojan in the rain and across the mudflat. On the trip up, spray from the rather rough channel and rain wet many pieces of gear.

The crew, when they came in, were wet, tired, and hungry. They scarfed down the slim fare and scurried around for more. We had a little trivia session with Bart Gordon providing some remarkable examples. Off to bed with the rain mostly gone. No boats in sight, only the winking buoys out in Magdalena Bay.

January 30, 1975

San Carlos, Baja California del Sur, Mexico

This morning about 9 we saw the *Dolphin* coming in, a great white motor sailor, 100 ft. long, that will serve as our tracking vessel. Not too long afterward the *Orion* came in. She is a trim swordfish boat of about 42 ft. We checked in with various skippers and then Bernardo and I went around looking for places to store our shore camp materials and housing for those who will stay ashore. We located a visitor's house owned by the government cooperative (CONASUPO) that had three bedrooms, a livingroom, and bath! Bernardo, who is tremendously capable in dealing with people quickly, made the arrangements. We will be able to store all our gear inside and take care of our people ashore.

We then visited the Fisheries School and then Sr. Armas, the Port Captain again. All protocol taken care of, we went on board the *Dolphin* for a glorious meal of chicken patties and many other goodies. I assigned us as many as possible to bunks on the *Dolphin* since there is a baptismal party in the CONASUPO house tonight and we cannot move in till tomorrow. George, Phyl, Dick, and I drove to Villa Constitucion for some

wine and as we drove along the rain fell harder and harder. The sandy desert soaked up all we saw run off the road and the toads emerged and hopped in front of our lights. We emerged from the Supermercado with two gallons of wine and a jug of scotch (the latter for the boat). George regaled us with yankee tales. He is a helluva guy—humorous, very broadly knowledgeable and bright, and has good cool seaman's judgment. He's also a considerate guy who wears well. The kind I'd be happy to be on shipboard with.

At camp the rain came and came. We polished off 2/3 of the first gallo, sang songs, and told stories, and then went to sleep in the damp. We'd brought all the perishable stuff in—a great whale rib that George had given me [?] at Colina Coyote. I didn't want the ink to run.

Finally to bed.

January 31, 1975

San Carlos

I was going to try for a capture today but Larry convinced me we should wait for better weather—a clear period is due tomorrow. So we had a meeting and laid out everyone's duties and went over a few safety features. Everyone has a job and a place and a time in the boats. It was a real pleasure to see everybody turn tail to get their gear in order—the harnesses with Larry and Tom. Bart will handle the tape recorder and hydrophones and he spent time rigging a harness so he could wear the rig around his neck and thus wade out into water with the whales. Up in the lounge George and Dick readied the EKG machine. The paper rolls they had been provided were too broad so they simply sawed off a piece, and soon it was running. John Hall was off getting boats lined up. I noted George out testing the small boat he will drive tomorrow.

The *Dolphin* is posh but I'm not sure how versatile as a research vessel. She has a fine lounge and galley on the main deck, a big clean bridge and twin diesels that apparently are a bit too big for her hull speed. She's equipped with gyro stabilization so she doesn't roll much. Everyone has good comfortable bunks and reading lights. She's panelled and carpeted and has a nice athwartships lab aft.

Bob Newbigen, the skipper, has an enormous pot and is the same old guy who dumped me off seven miles away from the Scammon's Lagoon entrance . . . full of flatly stated opinions about biology and full of reasons why it's difficult for him to do this or that. But with a little jolly along he comes around and he's a cautious seaman who doesn't run into things and generally gets his job done.

There are a couple of other taciturn types—the mate Joe Mehlin, one of the seamen whom I have sailed with before. The cook, Julio, is reckoned as the best in the Scripps fleet and very good natured. The engineer, Jim Thomas is new to me and I think he is bright, direct, and good. He spent 24 years in the submarine navy, a good enough recommendation.

Tomorrow at about sunup we will scout for whales over near the sandbar that blocks the bay from the Pacific. If we harness an arrival we will go below it on the *Dolphin*, between it and the Entrada, so that it will have to go by us to get out. This will leave us able to navigate out to sea at night, which because of uncertain sandbars, we cannot do here. Then will follow a capture of an animal for physiological studies, and hopefully animal No. 1 will still be in the bay so we will be a full force on our collecting crew.

We've all had good warm showers, washed our dirty clothes, the ship has taken on water and fuel and we are ready to go. Now if the weather cooperates tomorrow . . . At least we should have the normal early morning calm going for us.[Map]

February 1, 1975

Puerto San Carlos, Baja California del Sur, Mexico

The hundreds of details seemed mostly in order today until we began operations. It took a long time to cruise out in the *Dolphin*, anchor across channel from the Punta Magdalena, a lobster camp on the island, and launch the skiffs. At first the skiff motor (another Mercury 65) faltered but finally came around. Then the automatic direction finder wouldn't give a reading foreward. Larry and John began troubleshooting and rather soon found a coaxial cable crumpled under a door. That was part of the problem but it was finally solved by shortening one of the leads. Then we didn't see whales with young. I'd hoped to get them, near the island N. of Punta Magdalena but all we saw were adults unaccompanied by young.

William and I went on board the *Orion* to scout and Peter Zimmerman the skipper took us out into the Entrada area where Magdalena Bay enters the sea at a 5-mile-wide channel. As advertised, it proved to be the mating grounds. We saw no young out of about 35 animals. There were several groups of animals, in fact nearly all animals were in groups of three or more. We saw one group of five that on at least one occasion had six animals. These groups rolled, threw pectorals and flukes into the air, and often fluked free. I saw five full sets of flukes in the air at one time. I was impressed that morning that the animals in these groups were small, 30-35 ft. or so, and often much less blotched by barnacles and cyamid crustacean patches than the big females deeper in these inland waters. At least some of these smaller animals were males as on four occasions animals rolled over throwing the ventral surface of the tail stock into air, showing the penial sheath clearly. Once such a male had an erection—with about 2½ ft. of the penis extruded and laying over.

We saw these mating aggregations well up into the bay toward Punta Magdalena and along Isla Santa Margarita to the south of the entrance. It was only when we turned and penetrated up bay toward Isla Patos that we saw mothers with young. Such pairs were all we saw at Puerto San Carlos, and there they were moving back and forth with the tide just like those animals at Colina Coyote. Near Isla Patos an animal breached and I saw a baby nearly, possibly with a third animal, I couldn't be sure. Earlier one had breached near the Entrada that seemed clearly alone. Yet, I'm now skeptical that breaching is always by single animals. I'll have to see several more to renew my faith in that theory.

At about 3 PM we began tracking a pair north of Isla Patos. Tidal flats were not easily seen and it seemed very far to a beach. We tried to maneuver the pair nearer shore but they resisted well and even though I was most anxious for a capture I acceded to Larry's calmer judgment that we would have serious trouble taking the animal over that long flat. Since the *Dolphin* cannot leave at night we had to quit for the day, in addition to the fact that daylight would soon limit us.

So, back to anchor, considering the day as a shakedown for tomorrow. We have a tide about 8:30 and will have most of the morning to work. Two more things—the

weather has stayed overcast and blustery but now, at sunset, we can see clear skies to the north and tomorrow we may have some sun.

Second, when we watched the five-member group of mating whales they were accompanied by a single $\frac{3}{4}$ -grown California sea lion. We could always predict where the whales were below—when we saw her at the surface. This behavior persisted for at least half an hour. Why? Often the animal was literally in among the rolling whales.

February 2, 1975

San Carlos, Baja California, Mexico

Closer, but no cigar. We cast off shortly after breakfast and proceeded down the blind channel east of Isla Patos. As we passed the island the cormorants that give it its name peeled off in long wavering skeins, flying right at the surface. There seemed thousands of birds, pouring past us. I'd seen some whales in the area through the binoculars so we looked out to the south and soon saw some spouts. Shortly two pairs of mother and young came up the channel and we picked one large young to follow.

Peter Zimmerman is a patient fisherman who knows the value of a good stalk. Without revving his engine he crept closer and closer and finally put Jay right over the young just off Isla Patos. The tide was down and so we could get reasonably close to the beach for stranding the whale. But the shot failed. Jay could barely hold the heavy net and pole and dropped it. The baby hit the net and bounced off without ripping it free[?] or sliding into the sack. The animals bolted up channel with us following along. It took a hour or so for them to calm. By that time there was no beach near so we could not try again.

Finally we herded them back toward Patos and by this time it was early afternoon and the water had risen producing a mile-wide shallows. What to do? How could we get the animal off after harnessing it? Would we be able to work in the waist-deep water? Well, anyway, we tried. And Jay made a perfect shot and the die was cast. Pete brought us over as close as he could to the bank and we all took off in the skiffs with the line. Fortunately the day was calm and warm—most of the clouds were gone, thank goodness, as it made working in the water much more comfortable.

John drove the skiff into about three ft. of water and we began pulling. The animal had the noose back over its pectorals and was being towed sideways and able to rise easily to breathe. By taking it easy and slacking off periodically we brought the animal in over the flat quite a way. I decided to try to work in as deep water as possible in order to reduce the problem of reintroduction. So we set about harnessing in waste-deep water. The animal, a male, was slightly over 15 ft. long and reasonably easy to handle. Sig Rich and I stood by on either side of the head to block the animal's vision. I slid the net noose loose and worked it forward over the pectorals and tightened it again on the head. Meanwhile Larry, John, and Dick put on the harness. Bart and George stood by recording. The whale repeatedly uttered sharp clicks which were made when the animal seemed ready to blow but didn't. Instead it tossed its head up slightly and made quick, small movemets with its jaws that seemed correlated with the sound. I picked cyamids for Jim Krupe. They were common enough around the blowhole, lips, and especially in the axillae. The cyamids clung to my hands and wrists and dug their sharp little clactyls into my skin. Man can they cling! I suppose that is an utter prerequisite for a whale dweller.

Then we launched the animal, its mother far up channel, but we could see the boat coming down channel toward us, presumably following the adult. The young animal floundered at first and repeatedly dove, forcing its snout in the sand. But as the water deepened it took off more normally, but within minutes Bartl shouted, "What was that? I heard a shot." And minutes later there was the harness drifting at the surface, its explosive bolt fired. Why we could not fathom. Tom later came up with the notion that the radio might have fired it, as it puts out quite a strong brief signal and such a charge could load up the capacitors in the timer. I suspect he's right. Anyway, back to the drawing board.

Larry and Pete and I scouted by skiff into lower Devil's Bend, in hopes that we might find whales there. But we didn't and had to settle for some mangrove oysters and a nice ride at dusk. Well, what will tomorrow bring?

February 3, 1975

San Carlos, Baja California del Sur, Mexico

Frustration Monday! All day we moved up and down the channel stalking animals. Pete is a past master of stalking. Without a single rev change he sneaks up on animals and they respond by continuing their slow swimming, though they continue some evasive maneuvers. Babies change sides over or under the mother and they make modest course changes often enough and sometimes radical ones. We had four shots today and netted one animal over one pectoral. The hoop entangled in the line and we had a tense moment or two before Jay the "harpooner" dropped it because momma was right with the baby and had her flukes up against the stern post of the *Orion*. I yelled and he dropped it overboard and the big whale sank away.

It was very windy today—to 25 knots or more and this more than any other weather variable, makes for difficult collecting. The chop flatens and obscures blows and it is difficult to follow animals underwater.

The team jumped in the skiff and headed for shore only to have the animal shuck the net when we were 50-100 yards from the shelf. I had been slacking line to allow the animal to breathe and it escaped.

We had no more chances though we worked very hard all day. Phyl, Dick, Bernardo, and William leave tomorrow and George will drive them to La Paz while the rest of us fish. I enjoyed them here immensely and Phylly had a fine time and was appreciated by all. The cook aboard will, however, be glad to see my crew reduced in numbers as they are many more than he bargained for and I can't see how to assuage him, though I am trying to have as many as possible cook ashore.

February 4, 1975

San Carlos, Baja California del Sur, Mexico

Uptight Tuesday! Three or four more shots today and we had an animal actually back out of the net. We fish in the channel in front of San Carlos down to a sandbar called Isla Patos and a little beyond. At the lower end especially most animals are single adults or pairs and trios of adults. These animals move with quick locomotion, often with a sizeable bow wake and often with flukes being thrown. Mother and young move much more deliberately. When hotly or persistently pursued the females sometimes [?] and spy out. We had one animal do this often. We had run it especially hard. It did this at least

four times and I have to say its eyes were out in air on all but one of these occurrences. Vision?

The wind had abated some but it was still rough work and everyone was tired when I called off the chase at about 4 PM. We are beginning to show stress. Pete cusses in frustration. Jay buries his head when he cusses. Larry was in the blue funk this morning—partly tired and partly sheer frustration. I think he is also weak with his hypoglycemic problem. I tried hard to assuage his problems and at least to some extent succeeded. His little gal Candy seems in generally good spirits though. I must say having their relationship pull Larry out of the group is not to my liking, and their relationship shocked Bernardo, I fear. But that's water under the bridge and Larry has done a remarkably fine job and continues to impress me with his cool seaman's judgment. I need him to counterbalance my impatience.

A lousy movie, a call to Pat (we have BLM asking us to carry out some flights over the Bering Sea for birds and mammals) and then to bed. Lights out at once.

February 5, 1975

Off Punta Belcher, Magdalena Bay, Baja California del Sur, Mexico

Well, Paul Sebesta, who flew in with a couple of friends chose the midst of an operation today to remind me that today is the first anniversary of the sinking of the *Louson*. I'd rather not remember. Anyway, it has been an exciting, fascinating, and successful day.

Everyone was on board at 8 AM, the shore party having eaten in the house ashore. Thus the galley was a little less cluttered today. We checked gear, did a little redistributing of personnel to lighten certain boat loads, and went out to hunt. Tom and John went for a flight over the lagoons and the cape, and we planned to pick them up by skiff if we were successful.

Almost at once we came upon a mother and young up the lagoon above the muelle at San Carlos. It was little "red head," a nice big baby and his rather smallish mother. I'd guess her at 35 ft. or a little less. The tide was dropping rapidly forward and the channel edges were clear.

The animals were obviously aware of us and evading the *Orion* in a deliberate ponderous sort of way. But after an hour or so we had our chance and this time Jay did not miss. The net was on and we began a really hard fight. At first we were afraid of the shoal buoys off the pier and the ships, which might entangle our line so we headed for the flats S. of the muelle. We arced around the pair always keeping the big $\frac{3}{4}$ in. nylon line taut and pulling up on the pair with our engine off when we had paid out too much line (700 ft. or more). Soon we were yards off the flat and raced for shore. The line parties had converged, aided by our radio communication with skiffs, *Orion*, and *Dolphin*. This allowed us to have people stand by until precisely when needed. George Nichols stood off the *Orion* in the big whaler and came along for that crew within a minute or so of being called. Soon everyone was on the beach. I noted stingrays as soon as I stepped overboard onto the sandy bottom. Later, I actually stepped on one that slithered out from under my foot. I had socks on but no shoes. No one, however, was stung.

Mother raised a great ruckus at the channel edge, and the baby struggled to stay with her but our line party of about 10 people pulled her in easily enough. Earlier when

we had just four people she had threatened to take us out to sea, as a matter of fact, we lost ground with her. Once we beached her measurements were taken.

The animal was very strong and heavy bodied and sported quite a crop of cyamids, the red head patches being these peculiar crustaceans.

Jerry Koozman and his people set up and took respiration measurements with their new gear. This consisted of placing an instrumented stove pipe that measures velocity profiles by a differential pressure measurement across a grid. Jerry literally can draw a picture of a blow with it. Dave, his assistant, and I held the apparatus over the blowholes until the animal breathed into it. After two such breaths the gadget was removed and the animal allowed to breath unimpeded.

We tried an electrocardiogram but I called it off rather quickly as it became obvious that we had serious artifacts and were most unlikely to solve them. Periodically, the baby threw his head up and blinked his great crinkly eyes, seemingly in disbelief. Here was leviathan being crawled over by liliputians for sure and just as otherwordly. What passed through his mind?

While we were doing these mudane things a drama was taking place off the beach. As we pulled the baby onto the flat the *Orion* was standing by $\frac{1}{2}$ mile to the south and about a quarter mile from the channel edge. She came up toward the struggling pair to begin trying to keep the mother nearby while we worked on the baby. She was 200 yards away when the adult female disappeared for about 45 seconds and then came up under the stern of the *Orion*. She thumped against the bottom so hard that the *Orion* was lifted about 3 ft. out of the water and heeled over at about 35 degrees.

Pete, needless to say, gunned his engine to "get the hell out of this" and in 30 seconds or so she came up again, this heeling the *Orion* over at about 30 degrees or so. Pete said he could look down and see her swimming below him and then rising to bump him. She came up three times at 45 second intervals under the stern, threw her fluke up by bending her tail stock up. He said her flukes were extended five ft. or so above the water, and waved back and forth. He did not see her swipe sideways with her flukes but instead only up and down. She hit the starboard screw at least enough to cause a vibration at 1500 rpm.

Pete ran the boat wide open in circles, attempting to shake her off but she kept up. He figured his speed at 14 knots. Finally he threw three sea lion bombs and she left. He, however, stopped and judiciously would not come back across the bay toward us for quite a time. I don't blame him a bit. She obviously associated his boat with her calf's troubles and sought him out with vengeance in her heart. Pete felt that if he had slowed she would have caught him and possibly done serious damage. How much intelligence is back of all this on the mother whale's part is anybody's guess but I am convinced that these animals can truly be dangerous and that when angered or separated from their calves they especially deserve respect!

On shore we quickly put the harness in place, this time secured by a 6-day magnesium bolt, and launched the animal. Bart Gordon was recording through the entire capture and recorded many sharp "clacks" made by the throat and jaws and several good examples of grunts. The baby clacked as it was launched and did so until it joined its mother 500 yards SW of us, out in the channel and then all was quiet.

The launching was pretty simple as we were at the channel edge (30 yards back). The baby swam resolutely as soon as water was deep enough and headed straight for the

rendezvous with mother. Once together there was some lunging half out of the water, much white water and then long dives. The pair at first headed up channel but rather quickly turned and headed out toward Isla Patos and the entrada. I gave orders to the *Dolphin* to follow regardless of who was on board and set a skeleton watch of Larry, Candy, and myself.

I went ashore briefly before this to say goodbye to Sr. Arnias and Sr. Toscana and to thank them. I found the whole town had been watching from the muelle and was buzzing with it all. As best I could I made arrangements for everybody and left a broom for them to clean with, went back to the dock where George Nichols ferried me out just as the *Dolphin* was weighing anchor. The whale had moved down bay past Isla Patos and the signal was getting weak. George stayed behind reading *The Voyage of the Beagle* and waiting for our aircraft crew to land so he could ferry them out. By that time we had named the whale "Newby II" after the skipper. We'd named the first one Newby but it got away early so we had to make this one II. The skipper made a wry face but I suspect was pleased.

We moved down the channel and signal strength began to rise below Isla Patos. Obviously the pair were nearly out of the basin back of the island and moving toward the entrance, but on the Almejas Bay side.

The ship is so calm, we have so much room, chairs for everyone and quiet. It's a luxurious and tranquil. What a palace to do our tracking on. If you have to track be sure to pick a converted 95-ft. luxury motor sailer with roll stabilizers, carpets, paneled state rooms, and movies every night.

It's dusk now and the whales move toward Almejas Bay so we are taking a somewhat better position to scan down that bay if the whales move into it. All is working well, a good signal, the X-Y plotter gives us records of respiration one hour out of four and the crew is all assigned to four-hour watches. George and I take the mid watch.

Quite a day! Oh yes, the flight crew went only over Boca Santo Domingo, Boca Soledad, the channel, Colina Coyote, Devil's Bend, Mag Bay, and Almejas Bay. There were ample whales at each entrance, including between 30 and 50 at Almejas Bay. John Hal and Tom Dohl report seeing whales in the shallows offshore between Boca Armas and Boca Santo Domingo leaving mud trails. These were seen only in the "green water" from about 75 to 300 yards offshore, outside the breaker line. The trails were solid, not pulsed as they would be if found by tail beats. John reports seeing a trail following an animal that surfaced and both concur such trails were a hundred yards long or so, and often curved. They felt they represented feeding animals. Tom said he saw some adults with young animals and commented that they were "tanking up" preparatory to going north. John reports most adults but sometimes in loose groups of up to three or eight.

They report no animals at all from Colina Coyote through Devil's Bend into Magdalena Bay.

February 6, 1975

Cresciente Island, off the mouth of Almejas Bay, Baja California del Sur, Mexico

George and I are sitting here on watch (12-4 in afternoon) with our mother-young pair now inside the mouth of Almejas Bay. I've been asking him to describe how he saw the "jaw clack" of the baby being produced. George says the baby opened the jaws 10 to 15 degrees, enough to see end of baleen and tongue, then the jaws made a tentative

closure, a short “rebound” and then a final closure upon which the sound was produced. It was a remarkably sharp “clack.”

Bart could not pick up a clack when the baby had its head arched out of water as it often did in this maneuver, but once it was below water he could hear it clearly. thus the jaws seem to have to be below to propagate the “clack.”

The whale spent the rest of the day moving over the flats south of the Almejas entrance, quite a lot of it apparently spent reversing, as they were rolling at the surface, throwing pectorals and fluke tips out and breathing much more frequently than before. Later in the evening they moved up into Rehusa Channel south of Punta Tosco, where they spent the night moving back and forth in a channel filled with about 50 other whales. Anytime you look out against the cliff you can see a line of spouts from near the point to back in the bay mouth. [Drawing]

Punta Tosco looks volcanic to me, with a sharp fault scarp on its NW side, typical hanging valleys and a very straight coast all along Santa Margarita Island. To the north on the island are peaks that look volcanic.

Our ship's crew consists of the captain, Robert Newbegin, an old merchant mariner who has been with Scripps since the late '40s. He doesn't run things aground, knows his ship, and responds to the needs of the scientists, albeit at times a bit mulish and growly. He's spent quite a bit of time helping this or that investigator. I suspect he must be near retirement now. He's terribly overweight, but it doesn't seem to affect his performance any.

Bobby Holmes is a very quiet, gap-toothed fellow, pleasant and unobtrusive who goes about his duties when asked. Juliano Cutudio, the cook, we've already mentioned. He's happier now that the galley is emptier, and I don't blame him much. He has his interminable solitaire game going and keeps his galley like the engine room—spic and span. Everything is on time and plentiful. Jim Mehling, the mate, is competent, quiet, but with a sharp opinion or two also. He gives the impression of quietly taking your measure and of having his own boundaries and definitions (metes and bounds?) well in order.

Finally Jim Thomas, the engineer, a retired Lt. Commander in subs and in research subs lastly—very bright, ambitious to be a naval architect, more at home with the scientists than the crew, I think. He'll not stay I suspect but will find creative work. He's up through the ranks. He told us about working on the U.S. sub *Dolphin* at 5,000 ft. of depth and tracking sperm whales on the three-dimensional sonar, swimming right along with their phonating. He called them “carpenter fish.”

A good bunch altogether and good to be with on a program. This work is slow and you really have to care for whales to get much excited about it. Weather couldn't be better. A low swell, calm, warm during the day and clear. Now the stars sparkle and the air is pleasantly cool.

Newby II spent the night sleeping quietly up against Punta Tosca and this morning began to wander a bit. I wanted to anchor over at the cliff under the point to look at the great aggregation of whales there, but Newby balked and we had to settle for a skiff in the water.

John, George, and I went over first, about 10:30 AM and the closer we got the more whales we could see under Pta. Tosca. I guess there must have been thirty around us as we came within 500 yards of the cliffs. The bottom shoaled under us and became green and later Tom sounded it, finding 12-20 ft. A tide rip flowed along it in the ebb tide

and the whales were diving, rolling, throwing flukes, and spying out in the roily water. We came in close to the Punta Tosca light and could see lobster traps ashore, and the crew of a tuna jack pole boat on a nearby sandy beach, lolling in the sun. Meanwhile we entered the whale group coming within a few yards of many. George saw one pair spy out, pressed together. We saw one pair roll, belly to belly and later Larry, Candy, and Tom saw an animal flail its extended penis into the air.

Several times we saw muddy boils of water around the animals but never did I see muddy water issuing from their mouths.

Our watch was coming up, so George and I had to return. It was hard to leave, surrounded as we were, by whales. Shortly after we started back we came upon four whales, rolling at the surface. We were able to get right amongst them, in fact so close we all had fears that a random fluke or pectoral might smack us. We were six or eight ft. away at times from a crusty, cyamid and barnacle-encrusted adult whale over 35 ft. in length and as we now knew, with a notably ingrown disposition. We saw them roll in contact but I, for one, had trouble sorting out what I saw.

At the ship, Tom, Larry, and Candy took our places while we went on watch (after a fine lobster salad).

Not long after the ADF signal became terribly jammed with skip signals, some apparently from Western Washington Taxi companies. For an hour and a half this continued and we tried to interpret directional signals in the hash. Finally I concluded it was mostly imagination and the whales had probably moved off to the south. We recalled the skiff but radio contact was all but impossible. We could hear the outboard motor but voices were garbled. I had the Captain get the anchor up and begin steaming toward Punta Tosca, away from the supposed location of the whales.

Finally we could see the whales headed our way over under the light and rather soon she was aboard, her crew a bit reluctant to leave the animals, but understanding once they knew we had lost our signal.

Off to the south and soon we picked up the signal and overhauled the animals, ten miles down the coast. I had the ship close in on the whales to get photos of the pack and check how it was riding. It was working perfectly—no apparent flutter, centered nicely, the antenna in good shape and the pair together. The other scarcely broke water but we could see her bow and see her big “footprints.”

I was pleased to note that each pair of blips on the ADF represented one breath by the baby.

At this writing we have pulled away so as to avoid [?] the course of the pair by our presence, putting them on our beam about three miles away. The sun has set in a fine clear apricot and blue Baja display over Pt. Tosco, while off dimly in the east we can see the monotonous coast of the La Paz Plain, as our animals work south.

A word or two about Punta Tosco. It looks ideal for whale observation to me. There are between 30 and 50 pairs of whales there inside and 30 or so singles in the mouth and they come right under the brow of the cliff. It is quite a cliff, some 524 ft. high right back of Tosco light. The whole mating group spends its time in this area and I feel many come within yards of shore. A trail runs along the cliff face from the light to a beach perhaps $\frac{3}{4}$ mile inland along the cliff face. I'd guess this trail runs about 200 ft. above the water. The beach it runs to is a nice sandy one, bounded by rocky headlands. I

could see a bench above the tide and think a boat could be hauled up on beach rollers easily enough. I'm thinking, you see, of an observation station here. [Drawing]

February 8, 1975

*31 miles S. of Punta Tosco, off Arroyo Guadalupe, Baja California del Sur,
Mexico*

The harness came off at 0155 this morning while the whales were making their way resolutely south a mile or so offshore with us hove to about four miles off their beam. We'll pick it up when light comes. It's nice and calm though fog is coming in now, obscuring the Southern Cross, amongst other things.

I've been thinking about our two whales with packs reaching the ocean going south and wonder if a whale not ready yet to leave the calving lagoon doesn't have some southing left in his soul. In other words the urge to migrate rises and carries with it the change of sign to the north. Our whales, disturbed by the harnessing leave the lagoon where they have been harrassed and move on the only heading to which their physiology is yet adjusted. Which brings us up smack against what it is that changes the sign within the animal, and how it works for both sexes.

The female is recovering from parturition. Progesterone recedes? The uterus folds and reduces in volume, lactation is in full swing. Daylength progression does not change sign. The days have been getting longer ever since the female started heading south.

Perhaps the press of imminent parturition helps the animal select a lagoon. Do the mating animals at the lagoon mouth help bottle them in during birth and early growth of the calf? It's a violent scene when chases take place and calves may suffer. Our two southward animals went out at night if that makes any difference. Smallest young tend, I think, to be deep in the lagoons. Calves are very vulnerable I suspect.

Anyway, I'd guess interval changes within the mother somehow shift movement from south to north, and that our animals have not truly been ready for such movement. When they will turn I guess will be mediated by the changes mentioned above. I suspect our animals will settle along the coast somewhere around Cape San Lucas and then head north. Will they go in the Gulf or outside? Are the many whales at Cape San Lucas other hormonal refugees or are they normal animals? If we found a lot of calves there I might suspect it's aberrant.

There is a "Cabeza Ballena" just east of San Lucas Bay so it has been going on for a long time. Are they excess whales?

The bay is shallow and there is no room for segregation. What are the whales doing there? We've seen some going north along the coast, probably from there. What happens on the other side? Can animals make a migration that starts S. and then goes North (i.e. up the opposite coast of Baja?).

I think we'll make a trip down to San Lucas to see, return to Punta Tosco for a brief look-see at the beach for next year, and then back to San Carlos and home. I'll pick up the harness when we have good daylight for photography.

At about 9 AM we picked the harness up, probably four miles offshore, beeping nicely. It was considerably the worse for wear but still functioning. The antenna tip was bent over at right angles. The spring coil at the antenna base was abraded but basically intact. The float was cracked all along one side through both fiberglass and foam but also still functional. The paint on the top of the float was quite scarified. Other than rust

staining, it had made no evident marks on the harness material. The aluminum base plate was considerably pitted along all sharp edges as was the radio pack case. This had occurred in 63 hrs. at sea, and in excess of 75 miles of traverse. It seems likely that much of the damage may have happened early, during the thrashing after capture, or when the whales lolled and nursed in the shallow water off Isla Cresciente. We feel the water velocity probably enhanced corrosion strongly and perhaps impact or shear of baby against mother could have speeded the final release.

Whales sighted enroute to San Lucas, four adults going N., four miles off Arroyo Datilari.

Well, we moved it to the main program log. What we saw was a whale highway running diagonally from about Cabo Falso to Cabo Tosco. We were in fleets of whales, all as far as I could tell adults and sub adults, until we decided to cut inshore to about two miles, a few miles above Todo Santos, then we scarcely saw any until Cabo Fulso when we ran into them again.

The point we chose to cut in is about the edge of a 100 ft. bank that runs directly offshore. The whales do not turn at the edge of the bank but ignore it, going into perhaps 400 fathoms. Most whales were going north and we saw many rolling and a few breaching. I suspect that whales coming this far south represent the juvenile or excess male portion of the population plus the non-parturient females. [Drawing]

Tom decided on martinis and for me—disaster. Three of his concoctions and I was ready for some serious sleeping. I slept through a movie but apparently didn't miss too much.

February 10, 1975

Cabo San Lucas

We were anchored last night in San Lucas Bay along with a dozen other yatches. There are a couple of posh-looking hotels, and a ferry landing since I was here in 1948. But the hills behind look the same. I guess no number of Winnebagos will change some of these things.

We cruised down toward Palmilla and saw just a few animals, some marlin and other fish. Most whales were around by Cabo Falso. On the reverse track we had choppy weather and didn't find much more than before. George feels the deep water causes a "pooling of whales" at each end with only occasional animals making the dash across.

I suddenly realized that some of the important exotica of this trip have escaped my notes, like the girls from the Greek Isle, a yacht that was alongside us in San Carlos. These two, Betty and Diane, were hitchhiking and definitely earning their way south, as they were free to explain. Betty says, "I turned a trick for ten abalones on Cedros Island, and I don't even like abalone." They were reputed to have 12-dozen lobsters in the freezer. The best, however, was their business card listing their company as "Psychological Services—Single, Family, Group" with the two girls' names in each corner.

Anyway we cruised back over the deep area, only this time about 4-15 miles out, on a straight track to Cabo Tosco. While we counted more whales at the start it was just as vacant in the middle and upper parts. George Nichols explains it by suggesting that animals pool at both ends, one group at Cabo Falso (where most animals are located) and another at the northern edge where the 50-fathom bank drops precipitously into 400

fathoms or more. Only occasionally do animals transit across. As at other places where a navigational decision is to be made they mill and dive and generally slow annual progression before taking a course and moving on. Hence, few animals were in the gap and many at each end.

Perhaps more interesting was that we saw no young at all, only adults of various sizes including many in the 30-35 ft. range, or yearlings and juveniles. There was much grouping and rolling about. I would say that this southward extension of the gray whale population was composed of the same group that plays around lagoon entrances and makes occasional forays into the lagoons. Whether there is a more complex structure involved, like, say, the bachelor herd components of pinniped colonies I couldn't yet say. It's just too hard to see in a short stint.

There was no calving at all at San Lucas and no whales at all in San Lucas Bay. The ship plodded along on one engine to Tosco, arriving as planned, about dawn.

My crew was anxious for a planned outing ashore. I wanted to look for a camp site because the cliffs seemed to offer such a fine chance for observation of the behavior of whales near an entrance. We have looked at nursing behavior now and need the chance to see activity at the entrances. So, the little 13-ft. whaler was quickly lowered and George, Tom, John, and I piled in. Larry and CC would follow in the next boat. We scouted the shore from the lighthouse at the end back into Canal Rehusa. The lighthouse is manned and seems to have a balcony and two or three rooms below the light. A single uniformed Mexican marine was seen entering and leaving.

Below the light is a lobster camp, a little cliff-walled cove for skiffs amidst the lava shore, traps strewn around the rocks. Down the coast inland the steep hills begin to drop from their 500+ ft. height to lower dissected country bounded by sand coves and ragged rocky headlands. Birds are everywhere. Thousands of gulls on the sand, cormorants, ospreys building their nests, crows nesting in cliff holes, and turkey vultures in fleets circling overhead. Red-tailed hawks wheeled over ridges and canyons. Out beyond us over the extensive tide flats in the channel were the whales, spouting, spying out rolling, and breaching.

We hit the sandy beach farthest out on the point, where an old wagon trail starts, then ends at the light house. Here I think, is camp. Low bluffs back the clean sandy beach and on this benchland I think tents can easily be set up with a little spade work and we should have fine access to both the flats and the trail behind. I figure a mooring just offshore would be ideal to accommodate the whaler and an avon rubber boat for the surf. It's not much of a surf—two ft. or three.

John Hal tested the surf fishing and caught about five nice *Hoplopagus*, a mollusc-eating snapper, each weighing three to four lbs. or more. Some critter took his 20-lb. test line and snapped it, and a six-ft. shark came in near his feet while he was casting, causing him to retreat for the sand. From the cliffs I could see fish flickering amongst the rocks and sand near shore. Schools jumped offshore and as we cruised in 20 ft. of water or so, what I think were barracuda shot away from our bows over and over. Truly it would be little trouble to catch dinner here.

Larry, CC, Tom, and I hiked the trail to the lighthouse. It's broad and very old, in places washed out, but generally passable for foot traffic. It runs along the cliff face and at its highest (about 20 ft.) one can look a long way out to sea across the Rehusa Channel. I figure I could see down into the calm water as much as 500 yards offshore. No whale

came so close but one came near and I could see something of him below the surface. I'm confident that at low tide one could see these huge animals in rather clear water (15-20 ft. visibility) and underwater. With luck they might come very close. The water's probably 30-40 ft. deep within 50 yards of shore.

The hills were a garden of flowers in bloom—succulent agaves in flower, a fruiting plant like a passion vine with bright red fruits that looked like tiny rattlesnake watermelons when green, fruiting jojoba (*Simmondsia*) plants, torota trees with mucilaginous sap, a crawling mallow with lovely yellow flowers with red spots in its heart, a *Cistus* or rock rose, yellow, crawling, a pretty padlike succulent Aizoaceae, *Encelia*, with yellow-brown centered flowers, a lemony composite that nearly overpowered us with its smell and many others.

Sour pitahaya is common and there are occasional cardon grande, and we saw many *Cereus* cactus and the little chilito or fishhook cactus, especially on the higher rocky hills. I thought we should climb the high peak to check visibility so up we went, clambering over loose talus and rocky ledges to the top. From there the view of the bay was magnificent. I could see clear over Isla Cresciente, back into Almejas Bay, and see whales spouting there six or seven miles away. The entire channel and its sand bars was outlined for us, and we could see out to sea and up along the rugged outer coast of Santa Margarita Island, where the afternoon chop ruffled the water to white. It'll make a helluva camp and with some work we should be able to learn a good deal about whales and their habits at lagoon mouths. I know of no other similar opportunity. Entrada at Mag Bay is not nearly so good. The hills are lower and the entrance broader and generally rougher. All the northern lagoons have low sandy entrances. We'll be back. Now to make it home.

Now we cruise inside Mag Bay toward our pier at San Carlos. The ship has stopped pitching (she scarcely rolls because of roll preventing vanes) and we retrack our steps of a few days ago. I wonder where our whale pair is now? I hope calmed and back to equilibrium.

We'll pack tomorrow and Larry will drive us to La Paz early on the 12th. Some of this is to avoid hotel expenses as we are very low on money.

It's been a good cruise and productive, and now I look forward to going home to see my family and home . . . the livestock, the meadow and fences, and yes, the University too, though the thought of memos and mail is not enticing any way you slice it. We'll spend tomorrow packing and cleaning up and then drive to La Paz early on the 12th to catch the plane home. Larry and Candy will drive up with the gear.

Granite Mts. San Bernardino Co., California, April 10-May 3, 1975 [??missing entries]

April 10, 1975

Granite Mountains, San Bernardino County, California

We arrived with Class III of the Natural History of California at about 3:30 PM to find the mountain shrouded in clouds. Veils of rain came down over the bajada. At the cabin the roof was still off and a few drops of rain fell. I assembled the troops and we began to build a makeshift roof. Timbers went up and were tacked in place, sheets of

plywood came up the hill and the tarps were hauled out and onto this jumble of uncut timber. By the time we were done a scum of ice and water lay over the floor but we had an amazingly watertight roof over most of the house. I built a fire on an old sheet of iron and soon people were clustered around the blaze and dinner was cooking.

Outer Continental Borderland Cruise, *Vantuna*, September 8 – September 12, 1975

Outer Continental Borderland Cruise, *Vantuna*, January 5-7, 1976

Cruise on board *Regina Maris*, off Newfoundland St. Pierre, Sable Island and Boston, August 11-September 14, 1976

Cruise on *Elizabeth C.J.* and *David Starr Jordan* to tropical Eastern Pacific yellowfin tuna grounds, “Behavioral Cruise.” October 11-November 8, 1976

Outer Continental Borderland Cruise, *Vantuna*, September 8 – September 12, 1975

September 8, 1975

California, Santa Rosa Island, Beecher Cove

Well, it's been one of those “beginning of a trip” days. Great massive foul-ups of unpredictable and probably unavoidable kinds, resolving then into a good and useful trip.

Our trip is a survey of the outer continental borderland, primarily to determine whether or not whales and porpoises are concentrated over escarpments and also whether there is a genuine division between the inshore and offshore cetacean fauna. We will also check pinniped and bird distribution and will travel from near Pt. Concepcion south over Tanner and Cortes Bank and then home.

Our scientific crew is me as chief scientist; Larry Hobbs, chief accomplice; Lee Jones, head ornithologist (and only orny); Gary Farrens, pinnipeds; Deb Dag, escapee from the office; Bart Gordon, also escapee; Herb Hyatt, BLM scientist. We are on the *Vantuna*, the 85-ft. research vessel of Occidental College. She has a six-person crew: Captain Eldon McAllicher; Dick Powell, Alternate Captain; Mel Willard, Engineer; Max McClelland, Crew Max; Steve Karsten, Student; Marilyn White, Cookie.

Larry, Deb, Gary, and I flew to Long Beach and stashed ourselves at the “Executive Motel” after a good Mexican meal, and arose at 3:45 AM to pick up tagging gear. Out on the freeway our limping Dodge Polara blew a tire and we thumped to a halt and finally on the embankment with one wheel in the mesembryanthemums. Now what? We had a little leeway, time wise, but not much. Larry and I called the AAA and a completely incompetent clod finally arrived, all yawny, flashing his 70 IQ. Can you believe it—he forgot his jack—on a tow truck yet. He wanted to bring in another tow truck to jack us up but we did it with our bumper jack. Off we went to a gas station, stopping at a closed Standard Station due to open at 6:30. I called a taxi and made my way to the *Vantuna* dock. Herb Hyatt was there but no Lee Jones. Bart Gordon showed his fuzzy face so only one was missing. He drove me back to the car and by that time the station was opening and cranking up pressure in the compressed air tank to change our tires. I sent Larry and Bart off to get the tagging gear and we waited for the car to be fixed. Finally it was and we left making the *Vantuna* at a little before 8:00. As fast as possible we loaded and left—still no Lee Jones.

Finally out in the hazy channel a call came and Lee had gone to the wrong dock. He finally decided to meet us at Santa Rosa Island, and on that basis we set course for Santa Rosa Island. Nothing was seen across the channel but a couple of sea lions and it was NE of Santa Barbara Island that we saw our first cetaceans—a group of about 8-9 *Tursiops*, big fellows, all milling about in the calm water—it was a nearly flat day. Later, S. of Santa Cruz we came upon a small skittish minke whale that would not let us approach.

Marilyn cooked us a grand hamburger lunch, which all consumed greedily.

Santa Cruz materialized out of the haze as we skirted up into the Santa Cruz channel between Santa Rosa and Santa Cruz islands. Sea lion sighting picked up and rafts of sooty shearwaters bobbed in the tide rip. Skunk Point, all banded with blown sheets of sand like a skunk's back passed to port as we strained to see the pier and anchorage in Beecher's Cove. Santa Rosa is sere and brown this time of year. The cattle are off the island and little goes on, I'm told. Above the bluff is a grove of eucalyptus and a couple of big barns, several houses, and big stacks of hay bales. A road snakes down a hogback and looks like it would be greased after a rain by the mud.

The captain, who is normally affable (when in deep water) turned serious and severe as he saw his fathometer indicate bottom and surface together as he worked in toward the pier. Lee was there—all his gear piled on the dock. Finally the skipper inched in, only six ft. of water under his keel and we literally fished Lee off the rickety metal ladder. Fortunately, he jumped and we were off. Anchor was dropped soon enough, a roast pork dinner, notes, conversation, and to bed.

If the weather holds like this we're in luck. Tomorrow 1-2 ft. swells are predicted though Rodriguez dome should hold more.

Course note: Our course took us up the ridge NNW of Santa Catalina Island and to the E. of Santa Barbara Island, but about halfway Lee called with the info about St. Rosa so we changed course to make a direct shot at Beecher on account of time.

September 9, 1975

California, Santa Rosa Island, Johnson's Lee

The morning came with fog lying on the water around us and the ocean calm as a lake. Before breakfast Lee Jones had a good sighting of an Arctic skua, about the tenth for Southern California. These birds are big jaegers and pick on terns in preference to gulls.

Our course took us south of Santa Rosa, within sight of shore and there we encountered two minke whales going in the opposite direction (E). They avoided us. S. of San Miguel over the edge of the escarpment we encountered many seals (*Zalophus*), plentiful birds and then at the SW corner of this escarpment we came upon a big blue whale. It surfaced a few times for us, once giving me a fine view of its big spatulate head, its steel gray body, and tiny dorsal fin. Not long after we entered a huge aggregation of birds, common dolphins, sea lions, and Pacific white-sided porpoises. It was a feeding school and spread very widely over the sea. Because it was composed of little groups here and there it was really impossible to count, but had to involve several hundred animals. It was one of the biggest groups I have ever seen. In it were groups exclusively of young juveniles and various all-adult groups.

We turned WNW up about the three-hundred fathom line and continued to encounter Dall's, lags, and common dolphins. Our course then swung west toward Rodriguez dome and not long afterward we came upon several small groups of *Grampus griseus* and common dolphins. An amazing number of cetaceans was seen and some dozens spaghetti tagged (nearly 40).

It has been nearly flat calm—just a low swell with gray overcast, but visibility of two miles or more most of the day. Magnificent weather for this usually rough piece of the ocean.

At Rodriguez we turned and headed back for the anchorage at Johnson's Lee. A big blue whale was seen shortly after turning. He arched his tail, very slightly threw his flukes, and disappeared.

I was disappointed that there was no chance to work around Rodriguez, but tomorrow work on the Santa Rosa-Cortes Ridge would suffer.

I've been just a little off—not serious but enough so I don't want to read very long. I hope tomorrow to be a little better acclimated.

On the way back we cut closer in to San Miguel and could see the wind and sandswept areas at the west end. The new kelp cutter cruised inside of us, loaded to the guards. She clips from the stern and then turns her bow to go home.

[Drawn maps]

Near Johnson's Lee we encountered two minke whales, one actually in the outer margins of the kelp at times. It was pretty skittish but we did get close enough to see it throw its head free enough to see the lower jaw and to get in the wash of its breath which smelled awful even two hundred yards away.

I saw two spouts from the whale and several respirations without a spout. The spouts seemed to come when the whale was quietest—either at first or after we had let it alone for a while.

Johnson's Lee is an old army base—old barracks marching up the hill—probably 18 buildings in all—some soulless buildings with multiple widows all in a line—vacant—open—no discernible architecture except Pentagon.

The captain and Allemate captain are fishing and we are gassing about this and that—endemics on Santa Cruz, and other weighty matters. Tomorrow, if we have enough forms, we head for San Nicolas and the broken submarine topography to the west.

I forgot to mention in more detail our encounter with *Grampus* on the eastern slope of Rodriguez Dome. There were scattered small groups and occasional small sea lions, too, and flashing schools of sauries leaping en masse from the water. The big grampuses with their tall, sharp dorsals, scarred bodies, and blunt heads rather thoroughly avoided us, never letting us within tagging range. Two big adults were accompanied by small dark gray young, both in the “assisted locomotion” position. One adult had a very white head, apparently from coalesced scars.

The *Vantuna* started SW along the Santa Rosa-Cortes Ridge. Minkes and a few sea lions were seen near Santa Rosa and then the vista became largely lifeless—calm gray seas with a slight swell and patches of thin fog and overcast skies. One could see long distances and the ship was stable enough to make watches easy. Lee Jones, who is an amazing identifier of birds on the wing, came up with one petrel (Townsend's) new to California, Sabine's gulls, flights of sanderlings far out to sea (they're not supposed to be there), and a single albatross.

Captain McAllecher cursed and cursed at his navigation gear. The radar seems to work about 20 instead of 50 miles and the Loran has only one usable line instead of three. What this means is that he doesn't want to go out of sight of land very far and doesn't want to go on a sea anchor at night.

I'd hoped to hit San Juan Sea Mount and the true continental slope, but it seems that we will do better to concentrate on Lanner-Cortes Bank. By the way he reports 24 *Orcinis* at the 40-fathom spot N of Sixty-Mile Bank, ten days ago.

As we made our way in toward San Nicolas we could see the Navy working close to shore. Shortly a big twin-engine plane buzzed us and buzzed us again, the second time talking over the speaker. It was absolutely incomprehensible except for “090 degrees”—or was it “180 degrees”—we couldn’t be sure. The plane buzzed us four more times, more gobbledy-gook. We finally got on the radio and found via a circuitous route through the Coast Guard that they wanted us offshore until 5 PM (when the Navy quits), and in a course of 090 degrees. We did it and shortly after 5 PM we pulled into Daytona Beach on the SE end of San Nicolas Island. The island comes down to a fairly long sand spit as a sloping badland, a series of rocky headlands and long sandy beaches.

We anchored off the kelp beds, had a magnificent turkey dinner, and did a bit of fishing astern. The overcast is breaking and a bit of the sun comes out over the cloud banks.

September 11, 1975

California, at anchor, 1 mile E. of Bishop Rock, Cortes Bank

A long gray day—a bit more blowy than yesterday but nonetheless with blessed little swell and only occasional white caps. We travelled a watery desert, however, except for some interesting birds. Not a porpoise or whale was seen. We headed for West Bank to the west of Cortes but the Navy intervened again, sending their gobbledy-gook plane bellowing over us. Once again we had to have the Coast Guard intervene for us because the Navy wasn’t (as usual) guarding the frequency (Plead 2182). They ran us out toward San Clemente—they were shooting missiles or something.

We returned to our ridge later, skirting the east shore of [?] Bank down past Cortes Bank and out on a submarine ridge east of Cortes. Tom had called in and planned to fly over us but didn’t appear and didn’t appear. I, for one, was a bit apprehensive for him, but he finally showed up after 3 PM. Our ship to plane radio barely reached him. He told us there was a big group of *Delphinus* 15 minutes to the west, but it was too late for us to get there for a “sea truth” (counts of porpoises from air vs. from water). Tomorrow we’ll try again.

We turned west toward Cortes to see if the bank sheltered pinniped and birds. Sure enough, birds became dramatically more abundant and sea lions began to appear in some numbers. I wondered where they hauled out and soon had my answer—on kelp rafts. We saw several fairly well hauled out and dry from the shoulders up. It was remarkable how far out of water they were and how many occupied one raft. One dense raft seemed pretty nearly covered with sea lions and birds.

Off through the haze we saw [?], the drilling vessel of Global Marine Corp. on East Cortes, drilling for some corporation, anxious, I suppose, to prove possible leases prior to the impending sale.

The ship is a freighter hull topped by a big derrick. She rode in the center of a four-point moor, a satellite vessel whose utility I could not guess, off to one side and what I take to be a Japanese long liner nearby.

Lee spotted a red-billed tropic bird and some tiny murrelets (Craveri’s from the Gulf of California) and finally some black-footed albatrosses. The weather held pretty well. The swell is higher but still very calm for these waters. Lee notes the slightest nuances of behavior or pattern and usually has an identification at a glance. Only a few times did we slow to give him a better look.

We circled around Bishop Rock, which is below water but topped with two buoys. We anchored east, it turned out, mainly because of fine indications of fish on the fathometer. Sure enough, no sooner than the pick was down and fish began coming over the stern. Dick had dipnetted a hundred or so sauries and they proved magnificent bait. Bocacios, yellowtail, rockfish, widow rockfish, sheephead, scorpionfish, and jack mackerel all came aboard. Dick baited a good-sized hook (about #1) with a 12-inch jack mackerel and soon we could hear grunts and squeals of joy as his rod bent half down. He fought and fought, his rod tip being tugged into the water and him jacking the pole up with great heaves. After 15 minutes or so I could see a great flash below and soon a 150-lb. black sea bass rolled to the surface all purplish and bronze with vague white spots. We broke a gaff but maneuvered the fish astern where racks let us get close to the waer. We manhandled it over ito them and thence onto the deck. A male, it squirted a couple of cup's full of white milk onto the deck. What a fish! Probably it was 18-20 years old and I mourned a bit for it. It can't stand fishing pressure because of its slow growth and even these will go when the rigs are in place here.

Tomorrow we try again for a "sea truth" at the bank west of Cortes and head for NW anchorage at San Clemente.

What a meal (among other such meals) we had tonight! A 15-lb. standing rib roast with fixins. Marilyn does a fine job and is a happy soul to boot. Good crew all in all.

September 12, 1975

California, San Clemente Island, NW Anchorage

Another gray day, but the barometer has been nearly steady and the wind low. It picked up outside Cortes Bank and on up W. bank when we bucked head on out a fairly low but somewhat droppy NW swell. However which we turned toward San Clemente it began to lay down and by the time the island could be seen through the haze it was nearly flat calm.

Our first traverse was west along the south edge of Cortes Band to N. Bank and thence up it. Just off Cortes we came into an area where we made repeated contact with sei whales. There big, fairly centrally placed fins, blackish backs, moderate size (35-45 ft.), very erratic movements underwater, and their failure to throw flukes when driving give them away. I did not see the scratch marks often associated with this species.

Each time we sneaked up on a pair (there were two or more pairs), it dove and evaded us under water, travelling remarkably long distances under water. Try as I did I never got very good pictures even with my miraculous motor drive.

Rather shortly thereafter we came on a small group of *Grampus* that refused to play the bow. That was all the cetaceans for the day.

Once again communication with the plane failed. Tom called us and we called back. He had left. Not till we were in the lee of San Clemente did he reappear and when we tried to deploy a porpoise radio to test his ability to reacquire the signal by air he disappeared, not to be seen again. Through all this our air-to-ship radio failed to work at all. It's damned battery pack had not taken a charge. Well, we'll try again closer to Catalina when the flight isn't so long.

Good bird day. A northern phalarope, a Leach's petrel, and a sparrow came aboard last night. Cowbirds and savannah sparrows flew on during the day, hopping over

the deck. Finally, two cowbirds left us as we rounded San Clemente, flying straight for shore, but we never did find out what happened to the sparrow.

Black-footed albatrosses were commoner today and Leach's petrels fluttered and swooped almost constantly in front of us on the offshore traverse. Another red-billed tropic bird, murrelets, gulls, terns, jaegers, etc. were common enough. Lee is great to have aboard. He is so knowledgeable and quick and so willing to tell us what defines this bird or that.

At anchor no fishing but for jack mackerel, but a nice chicken dinner, good conversation, a calm night and tomorrow up outside Catalina, around the west end and home.

Outer Continental Borderland Cruise, *Vantuna*, January 5-7, 1976

January 5, 1976

Johnson's Lee, Santa Rosa Island, California

The wind howls outside, coming down the steep hills above the old army base. Three of us are anchored here. We have come in enroute to the outer continental shelf area on a regular cruise sighting and censusing birds, pinnipeds, and cetaceans for the BLM Southern California Bight Survey. We're on the *Vantuna* as before, with much the same crew. McAllicher is skipper, Marilyn White is cook, her husband Daryll is a hand, Mel is engineer, and two new faces, Bob ____ and Al ____ are serving as crew.

Our party is Bob Guess on mammals, Mike Honig on cetaceans, Gary Farrens on pinnipeds and birds, and his girlfriend Marie-Angi as general factotum, and me. The routine is to go north so we can have the weather on our stern and head south along the broken topography of the slope margin. We spaghetti tag, sight, record, and plot localities.

The *Vantuna* takes us out of the harbor near dawn and onto flat seas to the north. Over the slope of an underwater escarpment east of Santa Barbara Island we encounter a school of Dall porpoise. I can't but marvel at their power as they crash into the water and their pure beauty of black and white—20 animals who race in toward us and leave quickly, we a passing diversion in their activity.

Later, off the 17-fathom spot midway between Anacapa and Santa Barbara we came into 250 Pacific striped porpoises, feeding and circling. There were as many as 1/3 yearlings or younger animals in the school, some leaping, which is unusual for lags. One yearling repeatedly leaped in an unusual way, sometimes close to us. It emerged upside down and threw its flukes over its head, cracking them down against the water with a great splash [drawing].

We turned on the north rim of the escarpment of the Santa Cruz Basin and headed west along the island, which lay largely fog enshrouded to the north of us. We encountered three gray whales, two adults and a baby, not too far east of the Santa Cruz channel. I saw the baby throw its head up once and others confirmed it. Last week Tom Dohl had flown over a pair including a baby—so they give birth successfully outside the lagoons sometimes, on the southward trip. Later five more grays were sighted coming out

of the Santa Cruz channel heading SE, so that channel does serve some number of grays for passage.

As we passed the Santa Cruz channel (between Santa Rosa and Santa Cruz islands), the wind picked up to a fresh wind level, building up swells and white caps. We crossed it pretty much abeam, going under the bluffs of Santa Rosa when it poured down from the cloud cap enshrouding the upper slopes of the island. Even Johnson's Lee was streaked with wind and the ship rocks at anchor, the moon swinging up and down outside the galley window as we roll. A big tasty ham dinner, conversation, notes, and fixes on data, and reading. I'm reading *Who's Afraid of Virginia Woolf*, a corruscating play.

January 6, 1976

Santa Barbara Island, California

Up at dawn and the wind still blowing, though not so strongly as last night. We skirted out past the lower bulk of Santa Rosa—a barren brow island, full of dissected canyons and benches, into the Santa Rosa Channel, between Santa Rosa and San Miguel. It was whipping with wind. The *Vantuna* took it badly indeed, bucking and whipping the seven-foot swells. There was no chance, I could see, to make Rodriguez Dome, or even the west end of San Miguel, so I decided on a diagonal course out past San Nicolas, the idea that with the wind quartering us she should ride easier and we should come into San Nicolas with the wind astern. I went below and not too long afterward heard her change course and begin to buck. I went topside and found the skipper had changed course as he thought there would be no lee in San Nicolas and didn't want to risk it without anchorage. He was headed for Smuggler's Cove on Santa Cruz, 40 miles away. I talked to him and suggested he get the wind on the quarter again by heading for Santa Barbara, which was in better position for the rest of our work anyway. He did so, after some fussing around and we had a fairly calm trip to the island, which we reached about the last light. Our travel over the Santa Cruz basin was about as devoid of animal life as you could imagine. The weather became flatter and flatter the closer in we came, and finally at anchorage it was calm. Santa Barbara, which I had never been to before, is barren in the extreme, cinder cone, mostly ash, but with some low patches of cactus, especially in the low canyons. The sea lions climb a cinder sheet on the southeast corner, getting 75 ft. or more above the sea in places. A quonset hut occupies a little bench halfway up the cone, looking all bleak and barren.

January 7, 1976

Home

Mac, the captain, and I plotted out the closed areas and found we had only a narrow channel between San Nicolas and San Clemente to travel, if we wanted to hit Cortes and Tanner Banks, and that Pyramid was closed because of gunnery, as in fact, was 7/8 of the island, clear down to the US border at 60-mile Bank. I finally just gave up. The boat isn't fit, the skipper is afraid, especially of the 5,000-lb. A-Frame on the weak stern, and the balance that results from this and the winch on the stern, bringing the bow up and causing her to snap roll. Yesterday, for instance, I was thrown across the cabin on the bridge, slammed back-first against the bulkhead and crashed against a bunk (whose leg I broke) by one such swell. It literally threw me in the air clear across the cabin. I had a little wind knocked out, but it was the action of the boat that worried me most. She

simply isn't fit for open sea work. The skipper is afraid we'll pull everything loose on the stern, and if he's afraid, so am I. So I said, "Let's cancel out, run around Catalina looking for pilot whales, and then head in. We'll just have to get a better, more seaworthy ship that can ride at sea and take the weather." He brightened for the first time on the trip, became affable (also for the first time) and off we went. Tom flew over us (as did Bem DeBuss of the American Cetacean Society in the Goodyear Blimp) as we neared Santa Catalina. I had Tom take a count of whales along the windward coast, and we did the same. We came out amazingly close together—I think we got 303 pilot whales, and he got 285 from the air. It was an ideal circumstance—flat calm (but blowing on Tanner-Cortes), and lots of easily counted animals.

Crossing the channel was like plying a lake, and after dinner at the dock we made our way home. I arrived about 9:30.

Cruise on board *Regina Maris*, off Newfoundland St. Pierre, Sable Island and Boston, August 11-September 14, 1976

[Description of *Regina Maris*]

Dear Family,

I'm writing this while still at sea, off Maine. I've just finished preparing a final exam for the students which they will take this afternoon on a rolling ship in a strong breeze (which because of the grass on our hull pushes us only about six knots). Phylly and I look forward to getting ashore on solid land with a good place to take a bath and such amenities.

Yesterday was nearly flat calm and we made about 40 miles all day because the engine is down, having its exhaust pipe cemented with a goop called "Red Hand," which apparently at-sea engineers depend upon to patch various things, but it takes time to set up. While in this listless condition a Yugoslav freighter scared hell out of us as we weren't sure if she was going to run us down and she veered past us much too close for comfort, tooting happily.

We dream dreams of vegetables, of sheep, of music from the record player, and for me of my poor ole tractor up in Fritz's front yard, and of course, of all of you.

The trip has been a full one but with the sea's usual ration of boredom too, and discomfort. The days tend to slip by in the open sea without many marks distinguishing them and only when one comes ashore, or near an island, do you have mental landmarks. But, when we look back there has been much of interest that we will always remember. Skipper George is a fine person, very sea oriented, kind, humorous, but firm when he needs to be, which is every once in a while.

We'll visit Alan and Carrie and the Schevills and then go directly off to Washington DC, where the days will be full of family affairs, and many meetings for me. Maybe they'll even have made up their minds about the Commission post by then, who knows.

Mostly, I guess, we would like to be with all of you, and to hear your adventures in the potato patch, the checkbook, in the far pasture, and like that. The sprawled-out comforts of home where one can wander and make a pizza in the night or listen to the

2,000-year-old man on the record player seem delicious, and how I wish I wasn't going right to sea again on that damn tuna boat. It's a bit like a sentence, though I know in that case, too, I will see a lot of new things.

Anyway, love to you all, and enclosed are my field notes that I think you might enjoy reading to each other.

Love,
Dad and Mom

August 11, 1976
Maine, Portland

Phylly and I are on our way to Newfoundland to board the *Regina Maris* out of St. Anthony. I will teach about marine mammals for three weeks. The ship is scheduled to stop at Boston, we to debark, and make our way to Washington D.C. to tend to various matters, and then home on October 1st. We'll see how it works out.

We bought a nice zippered partly waterproof field binder in honor of my birthday, and paper, a ruler, erasers, etc.

The weather is bright and clear after landing in the fringes of Hurricane Belle yesterday

Up through Maine, with some sightseeing at Booth Bay, and then to Bar Harbor where we boarded a ferry for Nova Scotia—a big ship with restaurants, casinos, decks, and TV rooms. Going out of the Harbor scattered groups of harbor porpoises cut away from us—swimming much like *Phocoenoides*—that is cutting through the water and dashing a hole in the water with their heads inside of which I believe they blew. Both Phylly and I were glad to get off the ferry. The jet lag's still got me and I dozed a fair amount of the time, uncomfortably.

At Yarmouth we rented a car and drove out along the north shore, a rolling countryside of pocket handkerchief farms, compact New England houses, and dormered barns. Most are lined up along the highway and names like Comeau run in bunches. This or that French family seems to dominate for a while and then to give way in intergradient areas to another. These are Acadian tribe descendants.

At Digby, which is on the Bay of Fundy's shore, we stopped for the night and walked the pier, looking at the scallop boats with their big chain dredges and beams aboard. Most handled gear amidships and most were large—50-65 ft. I'd guess. Lights glimmered inside some, I suppose waiting for the evening's work. Do scallops burrow during the day and emerge at night where they are susceptible to capture by the dredge?

August 13, 1976
Digby, Nova Scotia, Canada

The pier showed the tides to be very great, in excess of 20 ft. I'd guess—long pilings one beside the other so thick one could scarcely see through the pier—the water was low and the draggers clustered in a little hollow of water against the pier with mud flats all but cutting off the entry channel. Dinner, a walk, and to bed.

Halifax, Nova Scotia

On down the Fundy shore through neat little elm-shaded towns, green lawns, Victorian or earlier houses, mostly white with neat black trim, gingerbread in moderate

amounts. The house trailer makes its inroads. The owners of these blots on the landscape seem defensive about what they have done to the scenery as many have "cute" nonfunctional white picket fences and gay floral borders, plaster lawn animals etc., alas, ending at the trailer door.

We spent a fascinating hour going through a reconstructed fort at Anapolis Royal, built before the Plymouth Settlement; it became a pawn in the French-English struggles of the time, was burned, and then reconstructed beautifully too, all adzed, pegged tenon, and mortice construction, tall peaked roofs, battlements, peculiar little banded canons, a bakery with big bread paddles, a forge with a big bellows and coal bed, dormitory rooms, a sick bay with the chimney running up through it. Beautifully reconstructed.

On up the coast we went till we came to Grand Pre, the site of the expulsion of the Acadians. We saw a lovely church and garden dedicated to them, a statue of Evangeline (Phylly and I read it to each other), saw the nearly 5-mile dike the Acadians had raised to drain rich delta farmland. A lovely green land, the people caught as pawns in a struggle that ranged far beyond them. On down the coast, stopping at a beach with the tide receded thence across the rocky interior of N.S., a low mixed forest of maples, aspens, birches, pine, hemlock, spruce, and larch, very dense with undergrowth.

August 16, 1976

Halifax, Nova Scotia

Phylly and I did the local fort, watched the red-clad fusilliers go through close order drill, looked at relics of World War I and endless military uniforms on dummies. At dinner time we wandered down to the dock where the schooner *Bluenose II* was moored. A lovely ship with clear lines and real grace. I steered Phylly into a nearby restaurant where we could have a nice view of the Bay. Before I knew it we were hooked into a 30 dollar dinner (each). It was good but oh my exchequer suffered.

Next day we drove across the island to Noel and finally to Truro where we arrived just in time for the tidal bore. We waited on the river mouth on the bank as tour buses and cars began to arrive. The river flowed muddily between low muddy bluffs, in a modest channel flanked by broad bars.

I watched the gulls and sandpipers to see if they had means to avoid the bore. Aha! Fifteen minutes before the bore was to arrive, the gulls, many of whom swam in the water or stood on shallow bars, rose as one and stood high on the mudbank. There were back-to-back herring and maybe ring-billed gulls amongst them.

But, two minutes before the bore arrived some of the gulls flew back to the water and actually one swam through the bore. The sandpipers could have cared less.

The bore came as a bubbling apron of water, hissing and spilling in a little wave. What was impressive was that this wave spread across the entry channel and very quickly rose deeper and deeper. It was a rushing wedge of water at its center, maybe flowing five knots. Very impressive.

We drove back, stopping for milk and cookies at a little country store. Back to the motel in the rain, packed, and went to bed after a hit of dinner and a true vodka martini.

St. Anthony, Newfoundland

Up on a gray, foggy morning and out to the airport which is built about ten miles from Halifax toward the center of the peninsula. We did all the things one does—

luggage, tickets, turning in the car, boarding the plane, listening to the stewardess tell us about oxygen masks and exits.

After a stop in Sydney we hopped the channel to Newfoundland, landed at Deer Lake—a little community of 2,000 people stretched along a long lake amid smallish spruces, birches, pines, and larches.

It quickly became apparent that we couldn't fly to St. Anthony in time for meeting the *Regina Maris* on Wednesday. Today's flight had been cancelled, tomorrow's was full, and there wasn't one on Wednesday. So it was hitchhike or take a taxi. We chose the latter though it cost 160 bucks for the 300-mile drive. I rather liked the idea anyway as we could see the country with a guide that way.

So we contacted Loudon's Taxi and Mr. Loudon was soon there—a nice affable Newfie with red hair and a sometimes impenetrable accent. He was about fifty and had previously run a grocery in Deer Lake. We had a sandwich at Freddie's, the best in Deer Lake, so Mr. L. said, and then off to the West through great, rounded rocky mountains clothed with modest-statured forest—through Gros Morne Park, finally down to Bonne Bay along the coast (at a place called Norris point), and thence up the coast along a road alternately paved and gravel, but never as bad as we had been led to expect.

Many little fishing villages lined the shore—little cubicle houses, with shakes or clapboard siding, stacks of lobster traps ready to be set, and skiffs beached along the shore. Many nice coves and anchorages were passed, often with broad, beautified salmon streams entering them. We saw a few sheep and cows but mostly it was just fishing that supported these communities.

As we drove north the stature of the forest decreased until finally at the Strait of Belle Isle, across which we could see Labrador, the trees were carpets a foot or two thick and wind pruned. Muskeg spread out—little pea-colored ponds dotted with erratic boulders, reeds, and tangled diminutive shrubs, and rock. By the time we skirted the Straits of Belle Isle, eroded bedrock planed nearly flat by the glacier spread for miles patched here and there with low vegetation. The road skirted Pistolet Bay, down some canyons filled with dense, boggy forest and finally at dusk we reached St. Anthony, which is a town of 2-3,000 people, a mission hospital, oil tank farms, around a deep protected bay. No George, so we holed up at a local motel and got ourselves organized a bit.

At Hawke Bay, a mining port, we had a grand halibut dinner in a rough little restaurant with a cold lock front door (it dips to 20 below here).

Not far north of us at L'Anse-au-Meadows are the first habitations of white man in the new world—Viking remnants from 1,000 AD or thereabouts. Maybe we'll see them.

It's a cold, rather monotonous environment here but very interesting to us. The seas have been flat calm and tonight it's drizzling a bit.

August 17, 1976

St. Anthony, Newfoundland, Canada

Well, we tried to rent a car here but the car rental outfit has quit, turning the business over to the taxi drivers. Somewhat reluctantly we turned to them, and to L'Anse-au-Meadows (pronounced locally Lancy Meadows). Since that was where the Vikings landed and lived we decided to tap for it and shortly a rather sleepy looking character arrived in his battered taxi and off we went. The road wanders north around the Milan

arm of Pistolett Bay, into a couple of small cod camps, each with its little compact houses, teepees of spruce poles standing behind for use as firewood in the winter (when everybody quits work and plays cards). The cod boats lay pulled up in quiet coves and what they call trap boats were often seen upside down as if being worked on. There is water everywhere, and peaty muskeg amongst the forest patches. Finally we came out on a beautiful set of meadows and cobbly coves, backed by rounded bluffs and very low forest—L'Anse-au-Meadows—and came upon a little cluster of houses and a Canadian Parks building, which proved to be a museum staffed by summer college student help. Both were excellent.

The museum told us of the eight house sites down on the meadow, three of which were long houses, which consisted of long sod walls about 12 ft. apart, ending at one end in an outside wall, and at the other in an interior wall that was open at the center and entered a smaller habitation room. A door facing downwind opened out of this room. In the center of the long room were fire pits and the sockets of roof-support poles that apparently help up a very steeply arched roof frame that may have been sod covered. There were forges for melting bog iron, a charcoal kiln, and what were called the one-room quarters of slaves, whose doors opened upwind. I was surprised to find that the excavations had not provided mollusc shells, when the nearby beach was littered with them, or marine mammal bones. No iron implements have been found, but I suppose they would rust into nothingness in the time allowed. The place was supposedly first occupied by Dorset Eskimos, and stone lamps have been found, and then about 900 AD in came Vikings, supposedly of Leif Ericksson's crew. We visited the excavation, still going on, of nearby peat flats to see if artifacts could be found. They were finding precious few artifacts but quite a number of tree stumps too large for the present forest. The gal in the museum was a student at St. Johns University working in Anthropology-Social Work and was having a ball learning about the local folk. The little village had been settled in about 1850, at a time when the French controlled the coast and English people were allowed only as transitory workers. The locals, who are English and Scotch, served as caretakers, keeping the fish camps for the French, and in this way got around the rule, and when the English took over became permanent. They were of just three or four families and had no contact outside except by boat until the mid 1960s, when the road came in.

Back at St. Anthony I tried abortively to catch a fish, by hiking up in back of the Motel into the waning afternoon, finding some streams and many mosquitos and much wet vegetation, some over my head, and getting nary a nibble. I made it back to our room just in time for us to catch dinner at the dining room, and thence to look out the harbor and see the *Regina Maris* at what is called the American Dock on the other side of town. After dinner Phylly and I took a cab down to see her and report in to George Nichols, our friend and the master of the vessel.

The ship is a bit over 140 ft. overall, a barkentine with a square-rigged foremast, four jibs, two fore-and-aft masts aft, and some staysails between the fore and main. She has an elegant bowsprit and figurehead, and the name in gilt on the counter. She is powered, other than sail, by a 871 Jimmy Diesel, has a wheelhouse aft which no one uses because the sails can't be seen, and a big wheel aft of amidships that two steersmen handle in rough weather. She was built in Denmark about 1906, served as a freight schooner, was converted to engines, and then refitted by some Norwegians who coated

much of her interior with formica and other such outrages. Our cabin is the best in the house—our own john through it does take 50 pumps to clear the lines.

St. Anthony, Newfoundland

We spent the day moving aboard from the motel, getting our bearings and setting up class schedules and ideas, walking around getting boots and last-minute items, and things like that. A local teacher at the Trade School here, Mr. Brown, came aboard and I showed him around. He reciprocated by taking me for a ride up to the old US radar base on the hill. The old dishes still there, and old barracks and engine rooms, etc. in disrepair. We had a magnificent view of the bays to the south. His son Rodney Bown, a young man of perhaps 12, is interested in whales and I talked to him a little. He was shy and didn't ask many questions so I told him stories. I promised to send him a copy of my book.

More palaver and to bed.

August 18, 1976

Off Tooker Bank, Labrador

We shifted docks and picked up water at the fish-processing plant across the harbor, and then headed out the channel with George at the con and Ann the purser at the helm. The *Regina* went out smartly, into the open sea, and then headed north past the St. Anthony point, and up toward the Strait of Belle Isle. Belle Isle itself was ahead of us, a long, rather low piece of terrain out between Newfoundland and Labrador. The day turned windy and a strong swell broken into white and tosscaps came at us. We had set all sails and now the square rig foreward came down leaning only the fore-and-aft sails. The crew climbed all over the ship as if they were old hands, young gals up helping to furl the topgallant and royal sails high aloft. Though the standing orders are for safety lines at all times, some do not always wear them, especially the crew. I guess they are a nuisance when you are trying to move around. The ratlin's provide a good way up and then the footropes and jackstay? provide good hand and footholds once aloft. The *Regina* rides very smoothly, seems to me, after all my rough pitching rides on oceanographic motor vessels. The sails steady her. She is steered from the big wheel on deck in front of (foreward) of the after cabin and a watch is kept 24 hrs. a day. Up off Belle Isle we encountered several humpbacks. Their low mushy blow, unique dorsal profile (low fin), and very broad white-bottomed flukes serve to identify them. We were also approached by schools of white-beaked porpoises—*Lagenorhynchus albirostris*. The remind me very much of *L. australis*. Both are large, with very prominent dorsal fins, and both rush through the water, beating spray as they plunge along.

I fared quite well with seasickness, but Phylly went below ere long, and only felt passable when she was lying down and stayed in her bunk most of the time. I guess when the weather abates she will perk up. After a discussion with the students about the program, its good and bad points, I went off to bed.

August 19, 1976

Enroute, Williamsport, Newfoundland

It blew last night and as the sun rose we were greeted with a pretty rough sea. I was pleased to note that the *Regina* rode very comfortably over the seas, without taking much water through the hassepipes or scuppers, though Phylly was uncomfortable

enough, not being very used to ships. She stayed below most of the day until late afternoon when the sun came out and the seas calmed. I lectured in the morning about spinner porpoise behavior and was pleased to hold my audience under such circumstances. Some of the students were just holding on back in the crowded little salon.

No whales today, though we did see some schools of *Lagenorhynchus*. Both the white-sided (*L. acutus*) and white-beaked (*L. albirostris*) are here and apparently were seen during the day. I clearly noted the lateral yellowish partitioned pattern of *acutus* on one occasion. The white-beaked porp is bigger (to about 10 ft.), very bulky, with a big dorsal, and has two pairs of staggered white blotches on its side below and aft of the dorsal, and is otherwise quite dark dorsally. Only the white-sided has a partitioned lateral pattern. It is a little smaller, also with a large falcate dorsal, nine ft. max.

As the afternoon wore on the seas calmed and we came closer in shore south of Belle Island, and could see the cliffed coast cut with fjords, which form the harbors here. We will spend the night and tomorrow at Williamsport. I am gradually learning the names of the various sails, lines, and other parts of this incredibly complex ship. The students and crew swarm all over her doing things that I hardly understand. Everyone seems to know where the right lies are to tack, or furl, or raise or lower a spar, or whatever, and everyone is capable of scurrying up ratlins and working at dizzying heights on various tasks. Whale watch is kept far up the foremast and most folks seem pretty adept at spotting animals.

Phyl and I did a little deck work, working on scraping and chipping paint on a companionway ladder that needed work, and about 5:00 we came close to shore and began to enter the fjord at Williamsport at about 7:00. The steep fjord walls rose very high above us, probably 500 or more feet and occasional waterfalls cascaded into the sea. Much of the wall was exposed rock, showing long dark dikes of rock fissuring the lighter rock. We wound our way in the 600-ft. deep channel until we passed the little village of Williamsport. It once housed families, most working at the whaling station farther up the fjord. There were some three-story houses like barracks, several smaller houses, a church, a dock, and a string of six lights that are the streetlights. There are 5-6 people there now that the whaling station is closed, amongst them a great friend of George's—Pearce Caravan, who now fishes cod. The *Regina Maris* docked at the whaling station pier, all rusting metal tanks, winches under the tide, the old slipway gaping with missing boards, the big oil tanks standing rusty behind, slack-windowed houses and offices, paint flaking off, and the ground littered with the trash of such a place. One tank was filled with stacked points of whaling harpoons of two kinds, the blunt Japanese that doesn't skip, and the sharp Norwegian. The favorite sport soon developed—singing into the top of a 40-ft. diesel fuel tank which reverberated so long that one could sing with himself in four-part harmony by changing key.

Pearce came aboard—a little wiry man who had to hug all the girls not once but several times, and who was full of stories, including one about the thrasher that helps kill whales—that has a sword coming out its belly, and how it teams with swordfish to kill whales. He also regaled us with stories of the Calumet River and his experiences in the bars of Detroit, etc. etc. He said it wasn't going to blow while we were here, but refused to say why.

Finally, George and I decided to try a little fishing in the morning before lecture and Phyl and I retired to our quarters, she feeling much better, and me tired from the day's activities.

August 20, 1976

Williamsport, Newfoundland

Up at just after dawn for a bit of fishing at the stream at the head of the fjord. George and I went up in the little zodiac, hell-bent for lection with a 25 hp engine on a boat for two. We skimmed the glassy dark surface heading for the head of the canyon where a broad stream flowed down into tidewater, between spruce forests. We landed, tied up the boat to a big rock, and staggered over the glassy slick rocks, dark with some kind of algae. Even the little pebbles slid over one another as if greased. One had to think about each step. Once upon the dry stones it was OK, though the bank was untrod by many fishermen and hence had no trail, so one stumbled through the grass to reach unseen boulders beneath. The river was broad and mostly fairly shallow. I caught a couple of brookies at the entrance where the river merged with the sea, or better, slid over the salt water beneath. There was also a pretty little trout in the stream of a bronze color with red spots down its sides. We caught none much over seven inches of that species (Arctic charr).

On the way back down I detoured through the low spruce forest and walked on the springy moss and sphagnum-covered forest floor. There were many *Amanita muscaria* scattered about in the gloomy recesses.

Back on board we explored the whaling station a bit and I found a nice creek running by its south end where the fishing was a bit better and easier since it tumbled from pool to pool. I caught two beautiful brookies and then went back to tell George and soon all sorts of folks were on the stream. It was tough going but I caught four and George a like amount, though he fell and we think cracked a rib. Nothing to do but let it heal, he says, and since he is an MD he ought to know.

I made the error of inviting a couple of Newfies to lunch without asking the purser (Ann). It did foul up the detail a little though there seemed plenty. But feeling foolish I retreated a bit. Later, at dinner the Newfies (the Randalls who are caretakers of the station) hung around with their little grandson Douglas wating to be fed and I had to tell them there wasn't food enough. Awkward, and one of those things I seem constantly to do. In the evening we had a beer party and singing session with Mike Taylor, the engineer presiding over the guitar, and as usual singing a lot of songs I don't know.

I'm getting so I know most of the ship's compliment now. Let me list them:

Tom Maguire—first mate, a good seaman and nice guy, from Ventura

Robie Price—second or thirdmate, also a fine fellow

Jim Watson—second or third mate, strong affable fellow

Paul Pennoyer—very quiet crewman

Mike Taylor—engineer, very calm and good, Dover, Main

Jim Goebel—very strong,, quiet, and a bit on the sober side (external appearance only)

Richard Kearsley—leftover crew from the Mediterranean cruise, long, smiling, gaunt fellow

Bill Monaco—early crew, very strong, athletic, quiet, perfectionist who works like a demon; he's all over the ship

Ann Radcliff—Captain George Nichols' roomie and purser. Quiet, temper close to the surface much of the time, strong, good

Jerry Brown—English lad, seaman, very capable, good in a song fest or a knot-tying contest, hard worker

Paul Tom Dubourg—the cook, a witty, affable guy of great good humor, good cook too

John Jake Salisbury—crewman left over, a little complicated and emotional, I suspect, though becoming affable enough

Students are:

Ann Preston of Boston—very sharp, has been an administrator for the government. 28. Land-use planner for courts.

Theresa Monk—slim, interested in whales, seems bright

Mark Sakaluskas—very quiet, but I am told sharp

Linda Noyes—not too interested in education, more in sailing

Don Eley—big, strong, bluff, bright and always with the witty needle ready

Mike Williamson—Maine, a teacher, in a top day school, thoughtful, bright, quiet

Kathryn Pyn (Kit)—Tall, willowy, red-haired, very nice, with a little smile most of the time

Ruth Stanbrough—Massachusetts. A hospital administrator, bright, committed to whale work, may want to become a biologist, a bit contentious but reasonable about it.

Randy Wells—slight, bespectacled, very capable graduate student of Blair Irvine. Working on *Tursiops*. Much more mature intellectually than most. Quiet.

John Hickey—intense student who has worked with Beamish, very driven and a bit studentish in that he asks for favor. Not much perception in his talks about what his audience cares about. Bright, a bit scatterbrained. (Pretty far off the mark—quite a bright and good guy . . . intense but very sharp.)

Jeff Norris—a mouseman from Michigan (early grad student). Very scattered thoughts, affable, good mind, but no especial sense of direction.

Hal Whitehead—English fellow came on board from a small sailboat, worked with Roger Payne, very fine young fellow. Great mop of untamed red hair.

Judy Perkins—fine young Gal with Hal in the sailboat (named *Patience*). Worked with Roger Payne on right whales. Very mature of mind and thought.

Ann Rittenhouse—an open, noisy profane young gal, full of energy. Bright.

Lea Donovan—Jim Watson's protector—very possessive, little gal, quiet, can't appraise her powers.

[Crew list for *Regina Maris*]

August 21, 1976

At sea, near Horse Islands, White Bay, Newfoundland

The sea was dead as a spike today. Not even birds were seen most the time. The sea lay flat and we made a knot or two. The *Regina* is wonderfully stable. I can't get over how the sails steady her, and she's heavy, drawing 12 ft. plus.

I spent some time learning about the ship. There's a book aboard about sails and rigging and I figure there are 135 names to learn, not to mention combinations of same.

The ship is wonderfully engineered and organized, having evolved over a long period of time. Every line is in its place, and I'm told you can go from square rigger to square rigger and find the same line on the same place on the pin rail, or the fife rail, and very much the same means of furling, stepping masts, building crosstrees—the only difference with these is that iron made some of the time-memorialized braces unnecessary so some parts like cheeks drop out. The British, too, use somewhat different names—for example deadeyes (which are little round washers for lines) are called lizards by the English. I learned to coil lines and hang them (belay) them on the belaying pins, and I learned how to set a sheet like the course, which is the biggest lower square sail. The students and crew are all over the rigging like monkeys. Ann Rittenhouse and Jerry went up and shinnied up the mast at the royal and sat on top of the spar. That would scare hell out of me. I made it to the crosstrees with my safety line snapped all along the way. It's a helluva long way up, even in calm weather.

We chipped paint and scraped old varnish as the crew is gradually making the *Regina* shipshape, Bristol Fashion, as Jerry says.

My trip up the main mast educated me about futtock shrouds, which are 1 in.-metal bars that connect to the crosstrees, and so I learn, are mainly to hold the parts of the mast together against the upward pull of shrouds and topping lifts and such like. But to the climber they are what one hangs on as you have to come up under the overhanging crosstrees, grasp the iron bars that slant outward to the edge of the crosstrees. It's a bit eery to be hanging upside down on these supports and then to clamber over the edge of the crosstrees to the platform, one's rear end dragging in space 50 ft. above the deck. I wasn't sure that the safety line was a good or bad thing. One hooks it up and then has to undo it to hook it up again, and usually at a Christawful time when hanging on is what one wants to do, and then the hook refuses to let go of whatever cable or stanchion it was clamped around.

We listened to a student talk by John Hickey, which I thought was better oriented toward his listeners than I expected, but I did not find it very analytical or useful. A piece about MSY, which really didn't say anything about MSY, but talked instead about common resource economics.

It did stimulate some discussion about the information deficit we face in managing whales, and how it might be solved without killing them. The antiwhaling sentiment is very strong on the ship, with some people taking a very emotionally based stand against all killing and without any understanding that the Japanese are no more monsters than we have been, but that the societal ethic governs.

Hove to, the ship rode very very easily at night. It was hard to tell it wasn't along dockside.

Phylly, by the way, is now fine and rosy cheeked and enjoying birdwatching and other diversions on deck.

At Sea of Cape St. John, Newfoundland

During my lectures on sounds, two minke whales came up to the ship and everyone rushed out, needless to say, to see them. They came right up under the counter of the stern and one could look down and see the whole outline of the whale with its white epaulettes standing out bright white against the dark water. They flirted with the vessel and then moved calmly off to stern. Pretty little whales, the largest about 30 ft.

We also saw some schools of *Lag albirostris*, and I was able to see the white patch that goes diagonally up the tailstock aft of the dorsal fin, and which is distinctive. These critters will have nothing to do with the ship, but cut under her and race away, the spray flying over their heads with each surfacing. We also saw them leaping in swifter locomotion.

I've been admiring George's actions as a master. He is low key and friendly, but when the ship is at all threatened he can be sharp tongued and abrupt—"hurry with the foreward spring line," or "get that bowline on the dock pronto." When takking the con in a tight place he is all business, demanding precise teamwork with his helmsman and with his professional crew. But, he is everyone's friend and teacher otherwise. But one learns where his stops are.

When one student missed the ship, and came alongside in a skiff, he would't let the person aboard but made him meet the ship at the next port. His order was not to be late and that was that. It's well done, and professional, and comfortable, and safe.

August 22, 1976

Cruising off Twillingate, Newfoundland

Before the lumps go down let me record the effects of the black fly. These insidious litle bastards are about 1/8 in. long and land on you when you aren't looking. They are common near streams and vegetation here. They apparently nip up a minor pot roast out of your epidermis and lap up the blood that oozes out, first being careful to introduce a shot of anticoagulant that makes the blood flow. The bite just sits there but about 36 hrs. afterward it has swelled up and is suppurating like mad and itching like about 10 mosquito bites all in one. I had been nipped pretty thoroughly on the lower arms and the damn bites kept coming up. They damn near drove me wild the second night except that I knew there was some super goop in the first aid kit, and I went back and found it in the middle of the night—a steroid mixture that reduces swelling. The lumps are only now disappearing and going away, and ceasing to itch.

Last night we came into a place called "Snooks Arm," which is a long bay (a fjord really) and we came in by lookout and fathometer in the dark. I could see very steep rocky promontories dropping into the bay on the side and a few little shacks and what looked like broken-down piers on the other, and a cluster of houses, some lighted at the very back of the bay up on a steep hill. It looked like a big stony bowl, and proved such. The very deep water, 25 fathoms or more, persisted nearly to the back beach, and we dropped the anchor in mid bay, layed out a scope of about 2½ times depth, hoisted the anchor lamp (just that), and set matches (on continuously, of course) and went to sleep. It was too late for a talk by the time we'd done all this. Anyway, this morning we rose to find our estimate of the bay was pretty close to the mark. The sails were set and the sea very flat, so we went out partly on the engine and then cruised across Notre Dame Bay, making our way toward St. Johns, but first such places as the Tickle, Fogo Island, and Funk Island (a bird sanctuary). Nice calm day but some well running, low cloud layer and scattered sunlight. Twice porpoise schools came near—one a fast-moving group of *L. acutus* accompanied by birds. The animals crashed into the water just like the somewhat larger *L. albirostris*, but they never came near us.

A manx shearwater flew by—a rarity, but there were very few birds—gulls and fulmars largely. Toward dusk we had reached Twillingate (off our beam) and the crew

fondly remembered their grand time in a bar there called Pig and Whistle, in which I gather they largely expropriated it from the Newfies for the evening.

Word games in the galley. One person looks up a word in the dictionary and writes its definition down and others write down their definitions, all are read and everyone guesses what the correct one is. Grand fun and many wild definitions such as "An old Chinese dish composed of catmeat and two redheads." etc. etc.

I'm lecturing in the morning now on conservation issues, and it's well received. In the midday I have started to learn the myriad lines, staring at the fife rail and spider rail of the mainmast. Tomorrow the pin rail. It's a maze, but much is coming clear, and I can do more than coil lines now, though not very much. I kind of know a luff from a buntline, but I figure there are well in excess of 200 new words to learn. Afternoon spent chipping paint from under the BT winch. It was red leaded directly after I finished.

Phylly's been looking at birds and talking to various people, especially the girls, and reading, and I think having a fine rest and time now that the seasickness has gone away.

August 23, 1976

At sea, off Funk Island, Newfoundland

About 11:30 Mike the engineer kindly poked his head in our cabin and told me the northern lights were making a show. I had mentioned earlier that day that I had never seen them. Up on deck in calm seas the horizon was banded with pale greenish light in two bands, one above the other. They didn't move or shoot as I had heard they do, so I repaired to the galley for a cup of cocoa and found the watch making usual watch bellyache noises (all good natured) and enjoyed my cup. Tom Maguire came in and announced that we had "heavy duty northern lights." They were shooting this time, in long vertical streamers, and there was the palest lavender caste to the green in some places. I guess they went $\frac{1}{4}$ way to the zenith.

This morning we were cruising our way along past Fogo Island toward Funk Island offshore. Fogo is a deeply incised island that is the home of a fishing people who resisted relocation by the Crown (which happened to many other outback folk in the name of providing work force for light industry and cutting down ferry expenses.) The Fogoers wouldn't leave and used their own ship for communication, and have been left alone. They're renowned as an unusually independent lot.

The day grew blustery and gray, with a chop and swell. But birds became quite abundant, with many Wilson's petrels dabbling and dipping over the waves. I saw several touching the water with a single extended leg. Then there were gannets—big white birds with black wing tips, black-backed gulls, puffins, and others.

Funk Island, which is a bird sanctuary, is low and rounded and small. Off it we encountered 4-6 humpbacks and were able to get rather close to some of them, and Judy Perkins was able to recognize one she had seen the year before—one she called Tongue Depressor. I was able to photograph on sequence of surfacing, blowing, and fluking all on one motor drive sequence. Hope it turns out. I used a 200-mm. telephoto and M2 setting at 125/sec.

Randy Wells, a fine quiet young scientist, very kindly provided me with the drawings of lines and their functions that are transcribed here. [drawing of Head Sails and Staysails]

The humpies were swimming along the deep edge of a striking drop of which rose abruptly from about 50 to 9 fathoms depth. They rather regularly dove for about 4 minutes below, and swam in pairs.

I feel kind of loggy today—it's a bit bouncy and very cold out, blustery, and took a half a bonamine for protection and it hangs on. Been better off without it, I'd guess. Phylly is doing well, except for chronic cold toes (which she has in Santa Cruz sometimes too). This ship's much better than most about boredom because there are the sails to tend to, lines to coil, and lots of work to do on varnish and the like, but nonetheless it's a slow life and a bit hard to adjust after keeping the schedules we do on land. But the exercise and the hard hand over hand work aloft or simply pulling on lines helps. I didn't do any scraping today. It was too cold and blustery for me to volunteer for deck work.

Just before dusk a minke came near and swam around us for some time, once sticking its very sharp snout rather far out of the water. Minke's don't blow. Also, I've not seen them inflate the nostrils or produce the cup in front of the nostrils that some other whales do.

Then a group of *L. acutus* swam up, circled the ship and dropped off astern. The yellow horizontal bar that extends out on the tail stock was clearly evident. I saw young animals in this 10-12 animal school swimming together in pairs with adults a dozen yards away. At one time the whole school speeded up, cutting water with their dorsals as they speeded along.

A nice dinner (meatloaf, cauliflower, fruit cake pudding and drinks). Nice. We hove to out in the channel with a 15-25 knot breeze, furling most of the sails. So far I mostly haul on lines—clewlines, sheets, buntlines, etc., when I see a need, and make up coils when everyone else flings the line on the deck. I'm getting better and may even try furling soon. But I'll wait for daylight and a little less wind.

Wall to wall gannets on one part of Funk. Phylly thought it was guano but it proved to be just pure birds.

[Drawing of fife rail and spider rail]

August 24, 1976

Broomclose, Newfoundland

The wind blew most of the night and had scudded us along half across Notre Dame Bay by morning. George had wanted to stay close to Funk because it was so good for birds and marine mammals, but no dice. Even with just a couple of small sails (staysails, I think) we had made many miles. Not comfortably either. The athwartships bunks we occupy threaten to sandpaper us down, or pull our epidermis loose from its deeper attachments as one slob back and forth in the roll.

It was damn brisk too, and intermittent rain swept across us, and only a couple of porpoise groups graced us, and rather few birds, mostly big, heavy-bodied fulmars. I talked on the tuna porpoise problem. There's lots of interest in these conservation issues aboard. And some students are very knowledgeable too. John Hickey, the one I thought least of, is really amongst the brightest, I think.

Phylly and I watched birds a bit, when it got warm enough.

Toward afternoon George decided to put into a long nook called the Broomclose, not far from Bloody Reach or the Cow Path, and various tickles, and to do it under power

because of rocks. For the first time I helped to furl, up on the yardarm. I only ascended to the Course (the lowest squaresail) but that was enough when one has to balance on footropes and lean over the yard to bunch the sail in and then tie it with a slip clove hitch. Damn particular too. Can't get pleats in your work as they might catch rain (who cares?). Jud Perkins and I were on our first try at such aerial work and commiserated with each other and got our safety snaps all rolled up in the sail.

The Broomclose is a lovely spruce bordered arm with a fine shingle cove inside and not too deep water. The bottom, however, tests out as rock and we have an onshore wind, so skipper George is being a bit wary.

Nice chicken dinner, and a lecture on currents by Ann Preston. Learned, or at least started to learn the pin rail lines.

[drawing of pin rail and cookshack lines]

August 26, 1976

Tacking in Trinity Bay, Newfoundland

A day spent sailing rather slowly around the headlands and into Trinity Bay. I lectured in the morning, read *The Blue Whale* (quite a lot better than I had expected), looking at birds and hoping for some marine mammals. None came, but I did see my first dovekeye, a very whitish alcid with a turned-up bill. We heard a very nice paper by Hal Whitehead on his non-lethal methods for determination of population parameters on the right whale. He has been able to determine most of the features used by population biologists by use of photographs.

I learned a few more lines, and am working my way back toward the main mast, but there are quite a slew yet to learn. A nice pork roast dinner. The weather is getting "fug" as George calls it, which indicates that the wind is coming up and will probably be around 25-30 kts. ere long. At this writing Phylly is snug in her bunk without too much roll to sandpaper her bottom surfaces, and I am about to quit and read about Alaska.

Judy Perkins told us about a friend, Jane Frick, who is working with Archie Carr on turtles, who knows where there is a peninsula in Costa Rica where sperm whales come in close enough to shore to be observed at the rainy season. This makes the place almost impassable and not many people get there but the whales do.

August 27, 1976

Trinity, Trinity Bay, Newfoundland

The night was spent tacking back and forth in the mouth of Trinity Bay and by morning we had made something like nine miles in our entry into the bay. All day long we watched a church and two houses on the shore. The only sighting was a brief one of some pilot whales. Some birds came near, including two dark swallows, but that was about it. I polished the binnacle, which was quite a task, and at the end coated it with petroleum jelly. Phylly worked on making whale sighting forms and transposing records from the log to them.

A couple of meals, some reading (I finished George Small's book on the blue whale—largely good, I thought, though perhaps somewhat overstated), palaver on the bow, capture of a lovely dragon fly into whose compound eyes we peered and then let it go, and much making up of lines, furling of sails, and such.

We will spend tomorrow in Trinity, leaving in the afternoon for St. Johns. I will enjoy the time ashore and so will Phylly. I've written a test for the students since some are taking a course for credit on the boat.

The entry into Trinity Bay was after dark, with the lights shining on the shore, revealing a round harbor, with low tree and grass-clad hills. Not till morning could we see the old dormered houses with their thin brick chimneys and chimney pots, geraniums flowering in the windows, the old wharf, greenish clear water with the stones of the bay bottom flickering in the gentle wavelets.

August 27, 1976

At sea, enroute, St. John's, Newfoundland

This morning was a lovely sunny one, warm enough that when Phylly and I went ashore, the wool pants I chose to wear were oppressively hot. Finally, in fact, I came back aboard because of them.

Phylly and I walked the town, which is an ancient one. It was first settled in the late 1570s and many of the houses in town are very old. The little gravel streets wind among neat houses with little tended gardens, most with wooden fences. The sun glinted off the old rolled wavy glass panes of the houses, and in many places we could see foundations made of stones, supported by newer cement. There is an old Anglican church set in a grassy meadow with a church yard alongside, its tombstones either fallen or in various angles, the soil around them hummocked as if by gophers or potato farmers who hillock their plants. On one side was perfect round harbor $\frac{3}{4}$ mile across, on the other, where we anchored another somewhat larger harbor. Both are well inside the headlands where the lighthouse stands, and where a fog bank swirled mist into the bay to be dissipated by the sun. Phylly and I explored the local stores (all closed on Sunday morning) some of the old houses, climbed to the schoolyard up on the hill where we could see the *Regina Maris* below us, talked to some of the old folks—pensioners are the major inhabitants, it seems, other than summer folk—much talk about who lived in what ruin.

Many of the houses in town have racks for cod—long ladder-shaped racks lying horizontally on 3-ft. legs, the tops slatted and covered with twigs. I found that when cod are dried the twigs keep the fish from sticking to the slats. The pensioners aren't allowed to sell fish, but can take enough for their own purposes. Many have cod boats, which vary from sturdy skiffs about 25 ft. long down to 18 footers. Most have a long, thin-bladed sculling oar and oar port aft, and a single cylinder Atlantic Gas engine. These are wondrous engines. They run with dry cells and one starts the engine by flicking the flywheel over a bit. It catches and the flywheel goes the opposite direction. Put put put, there is an accelerator lever that slows the engine down to a very slow put put, or up to about 5-6 knots. They are reckoned as the most reliable engine by local fishermen and everyone used them. The engine has no clutch and to reverse it one has to flick the flywheel just so and it goes backward, but mostly one simply slows down to such a degree that approaches to docks are gentle, or the sculling oar is used. Four hours on a gallon of gas, or about 20 miles.

We met a fine retired couple, Mr. and Mrs. George Lilly who lived in a lovely house up on the side of a hill. The old man was an interesting fellow who had been an accountant for the major whaling company on the Newfoundland coast during the 1930s.

He told us a good deal about the effort—six catchers, fished mostly fins, but also the others one would expect—humpies, blues (when they could get them), and seis. When the seis came they felt the season was over.

After dinner we let loose the gaskets (I worked the upper topsail yard—my highest excursion to date), and set the various sails. It must have thrilled some of the old seamen on the dock who had worked such boats in their youths to see the cloud of sail and see the seamen (and women) up aloft.

Phylly and George and I had gone into Trinity to get bread, milk, and ice cream for the galley, and to see the museum, too, in a little salt box house that had been given to the town for the purpose. The curator (Sunday curator at least) was a fine old gent named Goldsworthy, I think. He opened at two for us, and may of the ship's compliment trooped in. In fact we jammed the place. It was full of old flat iron collections, temperance banners, woodsman's wooden snowshoes, devices for boring long holes in trees to make ship's pumps and about a ton of books and papers. Everything was labeled by typewriter and scotch tape and no one stopped you from picking up the flatirons or anything else. Our curator kept up running commentary.

Try as we did we could get neither a paper or any news of what was going on in the world. No one could enlighten us about the Republican convention, even a lady from Brooklyn. Well, maybe St. Johns

September 1, 1976

St. Johns, Newfoundland

Yesterday we came down the coast rather close in at times, off a very bluff land, big rose-colored cliffs dropping straight into the sea. One big bird rookery was passed, but no marine mammals seen. Finally, toward afternoon we came to the slot in the cliff that enters into the snug circular harbor at St. Johns. About the only ark one sees is a lighthouse clinging to the cliff and a funny looking castle up on the bluff top, where, as I understand it Marconi sent his first wireless message across the Atlantic.

We were met by a pilot boat, a roundbottom little tub that rolled in seas in which the *Regina* was wholly stable. A pilot swung aboard, looking more like a truckdriver than a seaman, but he did bring us in nicely to the main dock on the waterfront, which was shared by two Russian and one Polish trawler (stern trawlers), a Coast Guard ship (Dallas), a schooner called the Myrtle and Grace (or something like that), all bedecked with flags from the nations she had visited. As usual the *Regina* was the big attraction and going about one's business on deck was a bit like being a fish in an aquarium—everyone lined up on the dock peering at each of us. We had a little birthday party for two of our crew—Ann Preston and Mike Taylor—cake on the deck, and wine. Later we wandered a bit of St. Johns looking for ice cream and entertainment. Not much of either. To bed. Poor Ruthie broke her wrist in a chicken fight (two people, one on top the other, attacking two others similarly arranged. She fell and cracked two bones. Seems OK though painful, and well set according to George.

We called home and all's well. They had a big rain which will do wonders for the fire hazard, and the pump broke, but otherwise OK.

The day was spent with various people doing various things for schedules and the ship. George off worrying about pilots, radio repair, fuel, and such like, others out after fresh produce like lettuce, and the things that disappear so quickly at sea. The engineer,

who is a renowned promoter, and very low key and smooth about it too, located a Dover man on the neighboring ship *Bowditch*, who had charge of the boatswain's locker, and miraculously there appeared on our deck and entire reel of new dock line—fine braided nylon at about five bucks a foot. I guess it's another problem for the Navy accountants, but they must have many.

For my part I called Washington to find out about the Commission and landed in the midst of the problems over the upcoming tuna-porpoise cruise. They still don't have a ship, the detail being hung up over our need to photograph. No word on the possible Commission appointment. I'm sure I'm hooked for that long cruise, which thrills me only slightly.

I tried Schevill but he was out so we settled for a letter.

In the evening George's doctor friend, Oliver Green, invited us out to the Conception Bay Yatch Club for dinner along with the crew of a 40-ft. sailing ship leaving tomorrow for Inverness, Scotland.

As we came on board prior to going to dinner, who should be waiting for us but a young gent named Anthony Jones, who tends the lobby of a nearby building and with whom I had struck up a conversation about various things including Newfie music (about which I know zero), but I had allowed a fondness for folk music, and lo and behold Mr. Jones had brought a record (which he insisted on giving us), a record player that was battery operated, but didn't work, and a nice little guide book to Newfoundland. We found he collects stamps and thus promised to send him some that I accumulate. Phylly suggested he might correspond with brother Bob, who is also a stamp collector, and Tony demurred, allowing that his writing wasn't very good since he had no education. I suspect he was near illiterate—a sweet young guy with every reason for success except opportunity. We were touched by all this because both Phyl and I are sure the five bucks the record cost meant a lot to him.

Through a light rain we assembled on the dock as Oliver Green and Mrs. Green arrived. The crew of the little sailing vessel was also there. Green is a tall, white-haired, courtly man, quite English, of the capable outdoor class. One senses he can and has done many things. Indeed he has—across the Atlantic three times in his recent 40-footer, with Montgomery in North Africa, a youthful enthusiasm for biology at Plymouth with D.P. Wilson, and work with whales, and thence to med school, a country general practitioner and then finding this too confining, made the long move to Newfoundland where he is an important physician and founder of the local "cruising club."

His wife, Jane, is a delightful, warm, tall, angular lady whose clear face belies her age—she is a grandmother some years over with five girls. Phylly especially enjoyed her.

The crew were sailing back after the skipper, Jock McLeod, had come over single handed. His little craft is "junk rigged" which means that his sails are heavily battened and do not require furling, but simply fall into folds. He's run the various lines through the bulkhead into his cockpit and can stay inside and run sails up and down without going outside, which must be dangerous for a lone man at sea. He's a tall very British gent, in spite of living in Scotland, whose passion and work is sail and who is very hard to steer onto any other subject. His partners were much the same, though one, David, was more interesting and seemed to be more aware of his environment. A nice evening, all in all, and I especially enjoyed the Greens.

This morning we did last-minute things, I went down the dock to inspect the little junk-rigged craft, and when I got back (after also invading the innards of a geophysical ship) we were ready to cast off. Fond goodbyes to the Judy-Hal axis, we left them waving on the dock, and thence out into the bay and beyond the squeaky spastic light house and into a rather large and confused swell, with much reflected swell from the cliffs. It got to me and my attempts to help furl the course were rather useless as the more experienced swept by me undoing my work and me hanging on for dear life up there above the slanting deck. I came down the ratlines the wrong way (to leeward) but nobody noticed. Right now we are off Ferryland and "The Hare's Ears." This place has more remarkable place names than any hunk of geography of my memory.

September 2, 1976

Off Cape St. Mary, Newfoundland

Another day's rather slow sail along the coast. North of Cape Race the sea was humpy with incoming and reflected swell but flat calm so the engine was used much of the time. Cape Race itself is a long low point of land all grassy (or so it looks) for a mile or two inland. What trees there are are stunted as if the winds which whip this SE corner of Newfoundland have planed them off. There is a fine representative lighthouse, red-topped and white stalked, with some red outbuildings, an antenna, and the low land. This coast is bluffed with many sea caves leading back into dark recesses where the waves shoot jets of spray into the sky. All along it's as if whales were spouting (which they didn't today).

Once around Cape Race the wind picked up and now we are under full sail and making about four knots. The ship slips quietly along, and if we didn't have a little one lunged Lister diesel generator banging away in the next compartment it would be silent with the water slapping outside the hull.

A long cod boat cruised up and three young fishermen yelled to us and began throwing cod at us, laughing uproariously as each slapped on deck, or against the wheelhouse or into the shrouds. Then they cruised away, their little Atlantic engine popping away.

The water is green now as we cruise the inside of the Grand Banks. Shallow here. Our plankton tow brought up sea urchins (and lots of plankton—ctenophores, chaetognaths, various larvae).

Phylly and [?] scraped the rudder of the jolly boat (which needs a paint job as badly as anything on board), chipped rust and started generally on the task of preparing the little boat for a new suit of paint. I'll get at her insides next.

About going aloft. I guess I don't much like it, though it's not fear of heights so much as just being inept and having the more experienced people keep undoing my gaskets cause I put them on backwards, or tromping over me as I try to get untangled from the cables. If the yards are braced around they push up close against the shrouds at times and I have trouble forcing my way through them, and don't much savor swinging around them over nothing but the deck 50 ft. below.

I do not like the feeling of going up the futtock shrouds where one has to climb an overhang. So aside from overhauling buntlines, which I can do perfectly satisfactorily I think I'll leave furling to the others and heave on lines on deck, make up lines on the belaying pins and things like that.

It's nice not having to prove oneself though there are those on board who feel these things are important tests. Second mate Robie is one. He tries consciously to bait me at times, undoing lines I've just made up, or simply standing in front of me. I'm determined not to be baited, and simply ask him for something else to do. I think he's coming around. The hardest case is Jerry, the British fellow, who is very uncomfortable around those with book learning and speaks fervently of wanting a regular ship's mess for crewmen (where they can be themselves regardless of these social pressures), but that's not likely to happen, first because the others are so well integrated, and also because there's not room. The first mate, Tom, is a delight. Works like hell, knows the ship like the palm of his hand, always a cheery word, and a funny one, gives me occasional jobs to do.

I've been writing on my book outline a bit and some ideas are shaping up. I think I'll get at that now.

September 3, 1976

In Placentia Bay, Newfoundland

"Cape St. Mary pays for all." A Newfie saying indicating that the area is exceptionally prolific. Indeed it is. After some days of having seen almost no animals, birds included, we ventured out into Placentia Bay today, past Cape St. Mary, and found the waters warmer (to 16 degrees on the surface), full of life, swirling with birds—gannets and shearwaters mostly. The latter swooped across the water almost constantly and rafted in the hundreds—a few sooty shearwaters but by far the majority the great shearwater . . . and whales.

I really can't give a reliable count of how many we saw because the ship circled so often in quest of this or that group. But there may have been as many as 30-40 in the area, or as few as six humpbacks and seven fins. There were also quite a number of *Lagenorhynchus acutus*. All were feeding, I believe. The fathometer trace showed a dense layer below the surface from about 1½ fathoms down to about 15 fathoms. It was dense enough to return a good trace. The whales of both species were diving without moving very rapidly and returning to the surface to breathe, or sometimes slowly moving at the surface. The finbacks of ten surfaced in a rush, producing a rather sizeable area of white water around the front of their snouts. The water did not, to me, seem to be related to swimming speed since animals that produced this bow wave weren't moving that rapidly. My suspicion is that they were coming up after having filled their mouths with water in the straining process, and that water was still flowing through the baleen as they surfaced and perhaps the throat was distended enough to produce the bow wave. Bow waves were produced mostly as the animal surfaced. We saw humpies breach, lobtail (once several times in succession), and flail their long pectoral flippers above the water. The humpies let us approach more closely than did the fins. Often they came within 30 yards or so of the rail, while no fin to my memory came closer than probably 75 yards. All the animals, birds included, were concentrated over the submarine ridge that runs along the eastern edge of Placentia Bay, 40 or more fathoms down, and to the west levels out in a broad submarine valley floor. I suspect the topography is a glacial valley. It leads ashore up the funnel-shaped Placentia Bay.

Our plankton tow through the area where the whales were congregated produced a not unusual assemblage and it may well be that the shoal was fish, and they weren't caught in the meter net—ctenophores, mysids, amphipods, chaetognaths, fish larvae, etc.

The weather is gray and a front is approaching. Dampy, is what George calls it. It is. Clothes cling, and anything we wear won't dry, especially with sea spray.

How do whales, or birds for that matter, find shoals of food? So far the underwater topography notion holds up well, except that many formations that appear to us suitable don't produce whales. But they can't be everywhere. Do they orient to the formations themselves, perhaps by listening to changes in background noise, as Bill Evans has suggested? Do they somehow echolocate, or hear, the shoals of food themselves? Do they intercommunicate between themselves and follow the signals of the whale that finds food? Do they smell it, as some fishermen believe? Is experience involved? Are migration routes involved? That is, do the normal traverses of the animal take them from bank to bank where food may be found? My guess is that the answer will involve more than one of these mechanisms, and that intercommunication is the most likely central modality, but who knows?

After dinner, much palaver, some scraping of jollyboat rudders, a new recipe from Tom Dubourge—he takes a cup of fruity red wine, mixes in 1½ cupfuls of roquefort, then mixes to a paste, broils chops on both sides and when they are about half done slathers them with this mixture (which also contains spices appropriate to the meat). The wine tenderizes, and the cheese makes a nice coating. Tomorrow we make it to St. Pierre, where we will spend the day and night before departing for the Gully off Sable Island.

September 4, 1976

St. Pierre, Off Newfoundland

"All hands on deck" was the first thing I heard today, coming through the cabin door from the crew member going through the quarters area. Once clothes were put on we went topside to find that we had hove to last night as we approached St. Pierre. One side of the little island is dangerous ground and the channel entrance is narrow and, as we found later, congested with boats. So, George wisely waited for light, and we moved in in the early morning light. The harbor consists of a series of low fingers of land enclosing an inner and outer bay, a roadstead under the shelter of the larger, higher, part of the island. I'd guess the main island may rise 800 ft. or so—all treeless grass and rock. The little town of about 4,000 people circles the back harbor, and one enters in past a group of old cannons, still on their trunions. We docked at the Customs wharf, which also houses the post office, a big, imposing, red-roofed building by the city square. As usual our coming was greeted with lines of curious onlookers on the dock. After some maneuvers we were warped around to the side dock facing directly into the town, a maneuver which George enjoyed doing, I know. He takes great pleasure in these ship-handling problems.

Shortly we were able to go ashore and to wander up amongst the very French streets—buildings right at sidewalk ends and built together. Varicolored (the same paint merchant that worked the Newfie coast was here), most with little entry kiosks to keep out the winter cold. We found a Musee, which was up a most tortuous set of rickety stairs, but filled with cannons and cod gear, ship models, photographs of stuffed birds, and other such things. This time everything was numbered and one was given a mimeographed volume of keyed titles. Thus I was able to look up the early knitting

machine, or the church bell melted down to a blob in the fire of '08, or whatever. We developed museum feet after a while and headed back for the ship. Phylly and I later walked a hill to look down on the little town, and then in the evening George, Annie, Phylly, and I had dinner at a stash called Le Cascade . . . snails, coc au vin, etc. George is fluent in French, which helps, though the rest of us have a word or two.

We wandered back to the ship where Phyl and I stood the watch from 10-12 for two of the more dance-minded types. We were treated to a fireworks display in the square, many of whose missiles passed right overhead. Much smoke, showers of sparks, bangs in the night, pinwheels castering over us into the bay, and the like. We were happy to be relieved by Bill Monaco and to go below. Damp night, fog drifting about, but still and warm, with lights shining on the water under the high fog.

St. Pierre has many cats, and some fine dogs that we enjoyed especially, including one fine spaniel type leaning in a doorway, who urged me to pet him. He then leaned on me, looking soulful. Nice fellow, all around.

September 4, 1976

Enroute, Sable Island, Nova Scotia

After sending runners out for fresh croissants we cast off on a bright calm sunny morning—quite unlike our fog-shrouded arrival. The multicolored houses lit up in the brightness, and the bay was beautiful. I photographed the little dories all pulled up on wooden ramps alongshore. Most have Atlantic engines, but with a universal joint on the shaft that allows the fishermen to pull up the prop when the boat is being slid out of water. These dories have a remarkable amount of rocker to them—very high bows and pointed high sterns, and much flare.

On out to sea, and because we want to get to the Gully to look for bottlenose whales we are motoring. Also, the wind started slight and rather much ahead, though now it is blustering and the sea is covered with whitecaps.

September 5, 1976

Enroute Sable Island

In the night the sea began to rock us more and more strongly and I dreamed of earthquakes until I realized what was going on. At breakfast Phyl found it raining above and retreated for more clothing. The sea was heaving with swells that crossed and tossed spray into the wind, shearwaters sailed in arcs about us dipping like sailplanes to the very surface of the water, skimming and swooping up and never touching the surface. A few gulls flew their airy flight astern and followed us. The petrels, buffeted by the wind, wheeled and turned in mini-imitation of the shearwaters. One could see their skill on a day like this when the wind blows and the sea heaves. For our part the ship heaves and tosses on the sea surface, water squirting in through the scupper pipes, or rushing in a sheet if we roll further. At the bows the ship heads into the waves and her flare usually stops her plunge into the water at the last minute, amid a welter of foam and green roily water, but sometimes she digs deeper and takes water on deck. She's solid, though, no shuddering as she breasts the sea.

I taught about narwhals and belugas, and did it briefly in the classroom as my pupils were apt to find physiological reasons for inattention (me too, though it didn't happen).

Well, Phyll is flaked out, just a couple of points off well being, and I'm flirting with the edges of malaise. They're calling first sitting, and that gives us about 15 minutes to contemplate whether we want food or not. I know we don't need, considering the indolent lives of "idlers" which we are (those who don't stand watch).

September 6, 1976

Off Sable Island, Nova Scotia

Most of the night we motored, but by dawn a couple of staysails and jibs had been run up to stabilize the ship. It was rough. Phylly and I in our athwartships bunks were sandpapered back and forth and stretched to and fro in our skins by the roll. Both of us were logy and a bit off today from the motion, and only in the evening did I pick up much steam. The day was a mixture of rough, tossing sea, the cross swells rising up in spilling white caps. Shearwaters were very common most of the day and their flight in the complexities of such swells and spilling water is a constant source of wonder. They never touch though their wings seem to sweep within an inch or so of the surface and their flight to stay a clean series of unmarred swoops down onto the water and up 10 ft. or so above it.

Rain fell in squalls, once while I was at the helm and I had to run for my foulweather gear while George stood in for me. The Regina is kind of cranky. The helm, which is by the leverage of cables and pulleys only, moves like a live thing and the sails can be felt to push the stern or bow over. For example if the mizzen is used the stern goes over and one must compensate with the helm. It takes strength to turn the helm, too, and I can see why two men are needed in storms.

Somewhere around noon we reached the gully to the east of Sable Bank and Sale Island, and then cut back and forth across it. The gully is a broad canyon in the edge of the continental shelf that drops to about 500 fathoms and rises right onto the eastern tip of Sable Bank.

I watched as the bottom dropped away on the fathometer. When we had exceeded the range of the fathomner (200 F) the call went out: "Whales." I gathered my camera gear and stumbled topside, as did Phylly. Three bottlenose whales were about 50 yards off the stern, moving slowly. Finally we found that there were five animals, one small young, a half-grown, and three adults including one large animal of maybe 20 ft. They are sleek animals, brownish fawn, with a lightish mark behind the melon, a very prominent bulbous forehead, and a pronounced beak that sometimes shows above water. Their rather large fin is well aft, somewhat falcate. I never saw flukes. The animals, true to form, had come up while the ship was hove to in a plankton tow, and didn't stay with us long after the engine was started. In between they circled us, sometimes within a few yards of the rail, especially under the bows, made traverses out maybe 200 yards and came in again. Gradually these circles took them farther and farther away and less and less close to the ship. I took perhaps 25 slides of them at various angles. Quite a show. The blow of the animal was either non-existent at times, or a low bushy spout of maybe two ft. in height. Though there was perhaps 15 knots breeze I think the spout would be low anyway.

I never saw flukes, and animals did not jump, and the only aerial behavior was a tendency of the young to throw their heads up more than the adults as they surfaced.

The water thermal structure at the region of the sighting was most unusual. It dropped from a surface temperature of about 15 degrees to about 2 degrees down 30 meters or so (most within 15 meters) and then got warmer again to 200 meters, only dropping slowly at that depth. [Graph]

We never saw Sable Island, but could see what were probably rain squalls over it. It is low (maybe 50 ft. or so), sandy, grass stabilized, light an open half moon several miles long, frequented by nesting birds, wild horses and gray seals, and the wrecks of dozens upon dozens of ships. It lies right on the edge of the continental shelf and is a trap. Winds come over it and any sailor taking into its lee stands the risk of the wind shifting and blowing him on the shore, either directly or on one of the cusps of the shoals at either end. Fogs abound, as do gale winds. Treacherous. It was too rough to try to land so George wisely headed back in toward Canso, Nova Scotia, and will take a traverse down the coast probably to Brown's Bank, tomorrow.

While I was lecturing on sea floor spreading, the call "Whales" went up again and out we poured into the evening dusk to see a school of perhaps 20 pilot whales (potheads) right alongside. There were several young, including one graying very young animal, with an attending adult. [Drawing] The whales rode the waves, changing direction from following us to ride swells briefly going the opposite way, and then turning again to follow us. The young threw their heads out just like *G. scammoni* does, and in other ways resembled them, except for the missing saddle and the prominent white marks,. Back to the lecture and then go below to read. A good whale day, one in which both Phylly and I were less than par and both of us beginning to feel the confinement of the boat more and more. My but I get a lot of sleep and reading time. We're just enough off not to have much ambition though. For instance some important editing I have to do lies unfinished. Oh well, it's a vacation, but we both look forward to the shore.

September 8, 1976

Enroute, Browns Bank, New Brunswick

We awoke this morning rather late—they called second sitting to which we belong, while we were still in the sack. The ship had made a turn after going toward shore away from Sable Island for a long time, and was tacking into the wind toward Browns, where we hope to see right whales, and others. It's overcast with spats of rain coming now and then. I gather the night had been clear and moon lines were obtained along with Omega fixes so we know where we are.

Various tacks took us down between Sable and the shore, and finally Jim the mate told me that Sable Island could be seen if I went up the ratlines. This I did, up to the Course and sure enough, far out over the now calm sea I could discern a line of lumpy black hummocks on the horizon, and occasionally a flash of the lighthouse that is situated on the middle of Sable. We came closer and closer and finally I was able to show Phylly the island by standing on the pin rail just above deck. From aloft I could see a long sweeping island composed of interconnected hummocks dark with dune grass. There is one large clear sand dune toward the east end, and one can see what may be the masts of a wreck near that end too. George found it takes five weeks to process permission to land so there was no question about us going ashore, and I suspect rather strongly that calm weather or no, he would rather not try. It is a trap that has caught many people and his power isn't all that great, since flat out we make about six knots.

So, I looked at that remote island, wishing to go ashore not pressing the issue at all. Someday maybe I can come and see it. It is a fabled spot, full of menace to the seafarer, full of interest to the biologist, and one of those little kingdoms that one can encompass whole. In other words, a good island. The land portion is 19 miles long and with the long spits at either end it extends 28 miles along the continental shelf.

Oil rigs are sprouting inshore of the island and we passed two, and one ugly looking supply ship that brings pipe and other supplies and is built to back under the rigs and offload long bunches of pipe into the center of the rig.

Sailing, in calm seas, mostly by motor, toward Browns. I delivered a not very inspiring talk about platanistid porpoises, and we heard an interesting one from Don Eley about redwood lumbering in the evening. There's quite a bit of channel fever building in the students (and us) now. Some of the students are wondering what to do next and how they might get jobs.

Well, to bed.

September 9, 1976

Over Emerald Basin, Nova Scotia

Wind fresh today, and the ship racing along at six knots held over and pitching into the sea. The weather was cold, and we ran through several rain squalls. Phylly and I spent most of our time below, except for my lecture on pinnipeds, which was good in spots and a little weak on local lore (since I've never been here before). I did find that Sable Island is an important area for both harbor and gray seals, in addition to horses, and that the Canadian government has a bounty on both species.

Two special diseases have developed aboard the *Regina*. First is the disease of Listeritis, which is an affliction of the after saloon where one can hear the insistent thrumming of the Lister diesel that runs the auxiliary generator. The effect is to put nearly anyone to sleep. We've taken to shutting off the generator during lectures, thank goodness.

The other is Tackitis, which is a headachy, sometimes even nauseated condition with skin rashes on the backside that develops from trying to sleeping in ay athwartships bunk when the ship is heeled over and your head points downhill, banging your scone against the bulkhead in an obligate to the ship's roll, and sandpapering your lower hide as you slide back and forth. Other than these afflictions and growing channel fever, all's well.

September 10, 1976

Over the Continental Shelf in 200 fathoms, NE Brown's Bank

Looking up at the deadlight in the overhead I could tell when I woke that the day was sunny. Not much roll either.

On deck it was flat and the *Regina* was making a majestic two knots or so, through scattered clouds and sunshine. A good day for sunning one's self, washing up, washing hair (which Phylly did) and other such activities.

Jeff Norris lured me up the mainmast for pictures, and not until I was on the ratlines did I learn his full design, which was to get me onto the topgallant yard arm, about 90 ft. above the deck, so he could take pictures of me clinging on for dear life, with his fisheye lens that would show how high up I was and the deck of the ship endless

distance down below. I'm used to going to the crosstrees above the course, but above that the ratlines are ropes only and narrow as they approach the masthead until I couldn't get my feet in one side with my big rubber boots. I'd brought my safety line and was clipping one in the scarier places, but this involves unclipping which is usually worse than ignoring the harness altogether, as you find yourself hanging from some nameless stay with one hand, over absolutely nothing trying to get the damn clip loose.

I clamped myself around the mast at the ____ and sat gingerly on the yard trying to get a handhold on the jackstays (which are metal rod railings bolted into the mast that provide handholds and a place to tie sail gaskets when the squaresails are furled). Jeff, who is one of the more timid of the students (he wears his safety harness) climbed all over the yard holding on with one hand while his feet swayed back and forth on the footrope (a cable below the spar that the crewmen walk on when furling sails or overhauling buntlines). With his free hand (where, did he get a free hand?) he took pictures. Then he was above me on the royal yard looking down upside down snapping away and asking me to look up.

I was glad to get down. The day had been calm but even so the mast at that height whips around unconscionably. I guess I'm just not aurally inclined.

About midday we noticed a big sleek freighter heading right at us. All of us watched as her bearing didn't change or as she seemed to waver on her course from side to side, as if she didn't know which side of us to go. We could see no lookout and couldn't raise her on the radio. George began to get anxious and ordered the engine started, even though some patchwork was being done on an exhaust pipe and the cement hadn't hardened. The ship came right at us, and we were dead in the water not knowing what to do. She threw an enormous white bow wave and must have been making a good 15 knots. As she was a quarter mile away we were sure she was going around our stern, and then when she was closer she turned right for us. George started the engines and began to try to get the *Regina* underway. Still on she came, and then tooted once. Then, when about 500 yards away she slewed around to starboard and crossed our bow not 250 yards out, casting a great bow wave that rocked us crazily moments later. Everyone exhaled in relief, little realizing how scared we all were. There was literally nothing we could do but hope, as we were dead in the water taking a plankton tow. We had the right of way on two counts. A ship coming in to starboard does not have the right of way and we were a sailing ship. She was a Yugoslavian freighter from and maybe 350-400 ft. long. Whew.

Got paint on both my rudder and tiller today, talked about locomotion, met with students over career opportunities, listened to a good student talk on green turtles, talked with George about plans for the *Regina*, and generally balonied it up. That's what one does, and thank heaven we have 120 ft. of vessel to wander on. The sea's still flat, we've gone out over the edge of the shelf, and an enormous red moon has risen, casting the ship and her sails in cool light. A lovely scene.

September 11, 1976

Over Brown's Bank, Maine-New Brunswick

The weather gradually became worse overnight and by morning we were rolling a bit, and I could see by the deadlight that it was sunny. When we went topside, that's what it was. No porpoises or whales today, but we did slide up over the bank, where we may

see right whales, and where the water was filled with fragments of sargassum. Nothing too special happened today. Many land birds have been landing in the rigging, especially flickers and various warblers. They are all lost, so far from land. We saw one exhausted flicker falter and fall in a flutter of wings into the wake. The loss must be very sizeable, considering that we are just a mote on the sea. The offshore wind catches them and sends them offshore. The effect is clear here at sea, but on land it would represent an almost undetectable spreading of animals from the habitats of their choice. I wonder if the Merriam Effect, in which ecosystems on mountaintops are more or less complex depending upon their size—small ones less than large ones aerially speaking. Perhaps some of the complexity simply gets blown away—birds, seeds, insects, and perhaps other things, so that the attrition from some species is so great that they fail reproductively. Who knows? It would be worth calculating.

I spent most of the day working on a tool chest, cleaning and scraping it, preparatory to varnishing it. I'm carving initials and a porpoise on it, and Jerry is making rope handles. He, by the way, has become very friendly now, I think because I've shown an interest in his work, which is mostly beautiful canvas work and sailmaking, but he knows much else in the seaman's knot and line lore. I spent a happy hour, for instance, poring over his copy of *Ashley's Book of Knots*, which is an incredibly compendium. It tells you how to tie hangman's knots, how to suspend celery, how to tie your necktie, and infinitely more. Creampuffs at 8 PM, and I gave a test today. Jake tried very hard to avoid it. Don't know if he succeeded.

September 13, 1976

Off Provincetown, Massachusetts

No whales or porpoises today, but very calm weather with the seas just lying there around us heaving calmly, lifting us like the sargasso clumps that float by. People are getting a little hyper now that we come close to shore. I feel both anticipating and a bit of reluctance to plunge into the thrash that inevitably awaits me. Phylly, I suspect, is more purely waiting such pleasures as land, clean sheets, a nice sit-down tub, and things like that, not to mention a good gam with brother Alan and wife Carrie.

My day was spent working on cleaning tools from the tool locker, and with cleaning up the paint locker. The tools were encrusted with rust but came out pretty clean. I then painted as much of their exposed surface as I could with red lead.

The students are beginning to corner me for advice now, and I've run through long sessions with Rit, Kit, Jeff, and Jake thus far. Good folks, all, some going through the problems of growing up, but all quality folk under such problems.

We've been going through country marked on the chart with various kinds of "swells," which I suspect are underwater drunlins, or some such, and tonight will turn toward Cape Cod and Provincetown, which we will make tomorrow morning.

September 14, 1976

Boston Harbor, anchored near George Island

The *Regina* sailed today through very calm seas on "the slow bell" or what is called iron wind"; i.e., the engine. The tip of Cape Cod was in sight when we first went on deck and before long we were cruising along past Provincetown.

I spent my day tidying up the tag ends of the class and getting the appropriate papers to George for his files. Then I worked on derusting a big vise on the deck workbench, red leading it, cleaning up the paint locker and then about noon George decided it would be lovely if I carved whales on the other two deck lockers. I had finished a porpoise on one, and a big R. So, while the ship was being spruced up by all hands I perched on the hatch cover and carved. I seldom looked up, as carving a humpback intaglio and a pilot whale from scratch was a bit of a job, but with jets now whistling overhead and small boat operators shouting advice about how we would have to fold our masts to get under the canal bridge (which isn't the way we are going). I carved on, finishing at dusk, just before George laid out the booze for our coming home party. Roast beef, wine, and a lot of Tenent's Beer afterward on deck (complete with pictures of pretty scantily clad girls with such subtitles as "so lonely," sitting pretty," etc.

The howling, dancing, and singing went on for hours.

Anyway, a good, rich trip, and one neither of us will forget. Tomorrow morning we make the short run to Commercial Wharf in deepest Boston Harbor, and then start our way toward Washington DC, via Strouts and Schevills.

Cruise on *Elizabeth C.J.* and *David Starr Jordan* to tropical Eastern Pacific yellowfin tuna grounds, "Behavioral Cruise." October 11-November 8, 1976

October 11, 1976

Off San Diego on board the Elizabeth C.J.

"Well, off on the greatest adventure of my life," as Max Schulman once said—but truly who knows what is ahead. I'm on board the *Elizabeth C.J.*, one of the premier tuna seiners in the yellowfin tuna fishery. She's an incredible ship—spotless, painted a light sea-foam green and white, 260 ft. long, with a long raking scoop-shaped bow, a tall mast on the after deck with an enclosed crow's nest where the fish spotters work using big binoculars. She's equipped with the latest—digital read-out satellite navigation gear that reads in latitude and longitude constantly, a weather chart recorder that spits out such charts on command, a great broad bridge with everything in its place and quite remarkable quarters—broad bunks, air conditioning throughout, a game room, a ladies' powder room decorated with violet carpet and gold wallpaper, and down below, all business—a huge immaculate engine room with two GM 2800 HP diesels that push us along at 17 knots (quite a change after the 6 knots of the *Regina Maris*) and a fish hold deck with space for 1700 tons of tuna that are sluiced in through collapsible metal channels to each hold. Right now there are . . . [?] filled with diesel. We burn something like 7,000 gallons a day.

There are four scientists aboard. I'm overall scientific leader, Dr. Warren Sturtz[?] is my project director and roommate; Dr. Bill Perrin; and Jim Coe who is in charge of a gear modification effort. On the *David Starr Jordan*, which waits for us at Roca Partida far to the south, are an acoustic team of Frank Aubrey, Steve Leatherwood, Don Jungblad, Dave Holts, Bill Rogus my new grad student and behaviorist, Dr. Ed Mitchell of Canada, and a photographic team, the Joe Thompsons Jr. and Sr. (father and son).

Our attempt is to describe the behavior of yellowfin tuna and porpoises in a [?] with the hope of finding ways of cutting porpoise mortality. We will photograph from ship board, from the helicopter and from skiffs, we will observe and divers will work below. We have 15 contracted net sets in which we can manipulate affairs and can then watch until the ship is full. We expect to be out six weeks or more.

Off Ensenada, Mexico, enroute tuna grounds

At the moment I'm a bit apprehensive about the complexity of our effort and being sure that everyone knows his place on each set. We'll prepare charts on this today and tomorrow and when we rendezvous we will talk to each person individually. I've made up observation sheets for most features we hope to record.

Our crew is mostly Portuguese and it is hard to communicate with some of them, but they seem affable enough for the most part and certainly professional. The skippers are Manuel and Joe Jorne, both Portuguese too, fellows who started with very little and now own two of these ships capable of paying off their 5.75 million cost in a couple of years. Both are in their 40s I'd say, on the squat side (like me), and I don't know much more at this time. They are reckoned as amongst the best in the U.S. fleet.

This morning we'll lay out schedules for everyone, and begin to assign gear and stations to everyone. I hope to rotate through the various places to have the chance to make things go smoothly, and to see the problem from all angles.

October 12, 1976

Approximately off Punta Eugenia, Baja California, Mexico

We're cruising southward, probably 20 miles offshore, in very calm seas (3 ft.). The roll is scarcely noticeable on this big ship. The crew has been getting various parts of their gear ready—the purse cable greased, the ponga engines checked and the little Bell Helicopter put in order. Actually, the latter was filled with preservative to ward off salt damage in the three days or so before we begin making sets.

It's been a gruff, even on occasion rude, time with some of the crew, but that is beginning to fade already and people are beginning to open up a bit. Some are obviously interested and with us. Hard to tell whether the fact that some of us are "feds" is part of it, and if I'm somehow known as being troublesome to the industry. To be sure, my own view is and continues to be that I want nothing more than to help the industry with its plight. I only want honest effort toward solution. This trip is one part of getting that cooperation and I hope deeply that it does some good. It's hard to tell what we can do. I only know it should have been done four years ago.

Anyway, the first day at sea, even on the very stable regal *Elizabeth C.J.* takes a little of the ambition out of one. But we did get some good things done. We evolved a schedule for personnel in the various sets (quite a task), worried a bit about safety (I'm not over that yet by any means), especially Bill Roger's efforts in the net, laid out a log for film in which everyone will register each roll and turn them in to me, and quite a few other details. We've learned what the capability of the helicopter is (about 2 hrs. 50 minutes aloft), where we can observe (there is a perfect platform below the crow's nest that looks like it could take all of us).

Over all this for Warren and I hangs the knowledge that the industry just exceeded its annual quota of porpoise killed (78,000) and our allowed take (390 animals) is

included, so if we are to continue we will require an exception from the government. I can't imagine them holding us up, but who knows about bureaucracy?

Most of us snoozed a bit today, on and off, and read our various novels. I'm deep in a long long one called *Shogun*, which is a good adventure story, but not much when it comes to accuracy about things like seamanship, and I wonder about the portrayal of the Japanese character. Well, it keeps me from other things. I smell steaks barbecuing on the afterdeck, and have just had a couple of drinks at evening happy hour.

October 13, 1976

Northeast of Cape San Lucas, Baja California

The day was spent getting ready for the work to come—laying out plans and schedules, figuring out how to handle film and things like that. Lots of food, some good booze before dinner, and then conversation afterward with one of the crew who had been born on the Azores in a sperm whaler's family. He described how they fished by long boat and how his mother used sperm whale oil to cook in—corn on the cob dipped in hot oil, yum yum.

I was feeling restless and had trouble sleeping, but blamed it on my apprehensions about the coming effort and how much remained to be done. But, by morning I began to suspect a belly ache—maybe a residual bit of intestinal flu, which I had a day or so before we left. Don't know.

October 14, 1976

Northeast of Clarion Island, Mexico

Well, we've made two successful sets today and I've developed a pretty good belly ache that's slowing me down measurably. The first set was a picturebook affair in the morning—big cumulus standing high veiled with rain below, and a nearly calm sea—maybe three ft. of swell and no wind to speak of. A flock of birds, all so far as I could see masked boobies and a few brown boobies, was seen a long way off. The helicopter was dispatched and sent back the word—"fish," and the chase was on. The pongas were launched very quickly—there's a sort of railway on the bridge deck where they are kept, and a big finger crane. They are lifted off with an open hook and the bow painter held until the engine is tested and then they are let loose and soon begin skimming over the waves. All used big Mercury outboards, and the owner of each has already spent much time getting them in shape—checking engines, renewing rub rails, etc. Once in the water they are directed by the man in the crow's nest—in this case Joe Jorge—who does it in voluble, excited and profane Portuguese—though he slips into English cuss words when the occasion demands. The boats pursue the porpoise in serial fashion, turn them back toward the vessel and then circle individually in an arc behind them which prevents their returning. Then they cut around them and cause them to mill while the *Elizabeth C.J.* comes up behind and once the porpoises are in a mill, the call goes out to let go. A man on the afterdeck whacks the pelican hook loose that holds a cable stretching up over the net and to the net skiff sitting on the after part of the net pile, her operator waiting at the controls. The skiff slides off pulling the net with it and the ship begins the circle. In the first case it was perfect—the set just long enough to use up the net and yet to close it when the ship had come around. The ponga boats stood by driving the animals away from

the last opening as it was closed. Then one of them stood by the net in case it was needed to drive the animals for some reason.

With the net out, the bow piece is run aft and then, as the net comes in, bunches of corks are pulled together (the bow bunches), which allows the remainder of the net to hang cleanly and the cork line to stay circular. The purse cable pulls in (tremendous strain)—one can hear the mast and blocks banging and slapping, and the winch whining low. Finally the rings are bunched and pulled up as a group onto the elephant's pecker—or ring stripper—a long metal boom down which a cable runs that pulls the rings on one after another. I was amazed to hear them clank onto the stripper and see a cloud of rust be banged loose into the air, even though they had just come from 50 fathoms down. With the rings in place the net is secure, and no fish or porpoise can escape, except for the rare one that jumps the corks.

Then, the net (750 fathoms around the corks x 65 fathoms deep) (fishes no more than 50 fathoms) comes in over the powerblock, and as each ring is reached it pulls free from the stripper and is stacked on the rail, very carefully, one after the other so they don't tangle. Corks on the starboard, mesh in the middle, the nylon-covered chain lead line next and then the rings of the port. Finally, judging from coded red net floats tied to the cork line the skipper knows it's time to back down. By this time the net has been reduced in area by 3/4, the porpoise school mills within 50-75 yards of the ship, and a shorter distance from the outer corkline. Not until about this time did I ever see fish, though the captain was calling out tonnage (he was right on—40 tons of fish). They come flickering in from below swimming in tight searching schools, looking for an escape. By backdown the pulling on the net has brought the big seiner in, causing the net to lobe out both fore and aft, but the big net skiff has hitched on by this time and pulls to counteract this effect . . . keeping the net from collapsing around the vessel. The bow bunches help this tendency, too.

In backdown the bow thruster is turned on pushing the bow out away from the net, the engines are put astern, and the big net skiff continues to pull away. The result is that what is left of the net stretches out into a long arc-shaped finger as the vessel goes in an equal backward arc. The porpoises, who have been staying bunched near the far corkline tend to get carried down this channel, which is maybe 20 yards wide, and becomes narrower and narrower, until finally it may disappear altogether as the oppose corklines come together. The porpoises tend to get swept down this channel and finally fill it from wall to wall. The captain pulls and animals slip and slide over the shallowly submerged corkline. There were two ponga operators and Jim Coe in our sets to help them out. Jim dove in and made his way down the channel in a small Avon raft, hand over hand. He did most of the rescue, signalling to the skipper when to pull with arm waves. We had about 350 animals in the net on the first set, and maybe 150 on the second and lost nary an animal.

Jim said the animals would sometimes lay below him on the slope of the net, looking up at him, and then, after some minutes time come to the surface and often enough go out of the net. At any rate, by working with them, Jim was able to clear the net in each case. I wonder how successful the other would be, or how motivated. Certainly they didn't get in the water like Jim did.

Once the porpoise were free, they did an Edward Everett Horton double take, looked around, and by what sense I could not discern (they squeak a lot in the net, Jim

says) decided they were out of the net and bolted for freedom, bursting from the water in clean arcing leaps.

Then the net came in and the slowest part of the operation began which is sacking up and brailing. This is the final drying up the net, in which men pull bunches of net together by hand, strap them, and haul them up by winch, and then do it over again and again, until the fish are crowded enough for brailing. In this operation a big dip net, closed by a chain at the bottom is suspended from a cable and lowered into the fish. The men on the net skiff, which by this time has pulled alongside, dip it down into the struggling mass of fish, and the winch hauls it up—a ton at a crack—thrashing, wiggling tuna, many over 100 lbs. in weight and a few monsters probably twice that size. For some reason the animals wound one another and the water is wine-colored with blood, most of it coming from the gills. The fish are spilled into a chute as the chain man on the brail lets go and the fish cascade out, often filling the big aluminum chute. Men alongside it guide the fish down the chute, which dumps below into the brine wells. There fish are sluiced to the proper well by water, and slide into be chilled down. 90 tons per well. We nearly filled a well today between the two sets or about 1/3 enough to pay the expenses of the voyage ($615/\text{ton} \times 90 \text{ tons} = 55,550$, or \$166,650 for the cruise).

Yellowfin tuna are beautiful creatures alive—fusiform and heavy, swimming with powerful quick little strokes of their tails. A gleaming gold band striped their sides, and blue shines above. The projecting fins are lemon yellow. But dead they turn gray and their fins are tattered by crowding in the sack. By the time they sluice below, even if fitfully still alive, they are drab.

I kept records on the second set, using my little handheld cassette recorder that I can dangle from my wrist by a line. I ascended to the crosstrees just below the crow's nest and made observations of the second set, trying to learn something about the porpoise and their behavior.

The following is a log of that set.

Start 1200, October 14, 1976. Loc 18 27 N 113 50 W. Solely spotted porps. Run directly oppose course of ship, 4 pongas. 50-60 porps, flight of birds, brown and masked boobies

1222: *E CJ* following in wake of ponga boats; porpoising a single tight group, often jumping from the water, now beginning to mill, ahead of ponga boats my estimate of porp numbers probably low, may be 200.

1226: Two distinct groups being driven into a mill by circling ponga ahead and boats behind.

1229: Boat let go. As pongas circle far side of por. school, 1/3 around. Porps mill quietly inside net mostly beneath the surface. One leap seen.

1231: School moving together deeper into net, 150 yds. from nearest net, animals swimming low in water.

1232: Circle essentially complete, net set made too large, so net is open by 150 yds. Being closed by net skiff, and winch. The entrance is being guarded successfully by ponga boats, as porps are clear across net as far away as they can get.

1236: 3 tail slaps, but otherwise porps milling slowly as far from us as they can get, but 150 yards from corkline. Calm weather, number of rain squalls. Many lifting tails out of water before diving, indicative of steep dive.

1241: Occasional splashes at surface indicative of interference or aggression between animals. Birds have moved outside net and are rafting. Porps mill.

1244: 75 yds. from far corkline. School elongated along 150-200 yards along net and 80 yds from corkline as far away as they can get.

1245: Net almost complete, far corkline at after quarter, nose outs to level of pectorals, and vertical dives in which flukes are thrown free.

1246: Animals moving very slowly, often lying at the surface with just the dorsal fin showing, for a few seconds and then submerging.

1248: A roll up. Porps swimming and diving very slowly, at far side of net, no evidence of aerial behavior.

1305: Net is rolled up for perhaps $\frac{1}{4}$ length of net. Porps mill quietly in unison, swimming as far from boat as they can get, but staying 70 yards from far cork line. Occasional nose outs, 2 blows under water, 150-200 animals, all spotters.

1330: Roll up continues, net 250 yards across.

1340: Finally coming in past roll up, piling it on deck. Porps still milling, moving slowly, recog. subgroups, milling circularly, stay away from net. Upside down leap and head and tail slap, as if driven out ban animal underwater.

These sets are a major source of mortality primarily because no one has figured out how to release animals prior to backdown. If bow bunches are released animals won't go near ship, and if cork line is depressed they may not swim through the resultant opening.

1340: Animals stay in deep water, and if it is rough the net can collapse on them.

1349: Porps as before. Baby just jumped.

1352: Long lobe of net developed, animals coming closer to far cork line and breaking water more frequently than before. Coming somewhat closer to far cork line, diving steeply, white water for lobtailing, and underwater aggression, low level leaping more frequent. A lobe developing, but porps stay out of it in deep water.

1355: Head slaps, come closer to *Eliz CJ* as net becomes smaller. Ponga boat tows not open.

1359: Porps close to *Eliz CJ* (50 yards) but still as far away as they can stay. Noseouts common as animals lie relatively doggo. Animals milling and undergoing low level leaps part way out of water. One can still see subgroup structure in school.

1402: Porps in tight group, 50 yards from rail, perhaps 20 yards from far cork line, staying out of complicated net where ponga is. Skipper decides to haul net in Starlite reaction from winch.

1406: More rapid surfacing, more at surface than below, coming up in phalanxes, several throw noses out. 7 men astern handling roll up, one man on watch, one on winch, one ponga. A marlin in net.

1410: Distinct subgroup structure, speed of groups varies, size varies from 2-3 to 12, 70 yards from us. Whole segments of school facing same direction, while other segments go in opposite direction.

1425: Net 200 ft. circle. Tight mill, as far as they can get and still maintain 20 yd. to corkline, subgroups together, oriented away from speedboat, first fish.

1427: Jim Coe jumps in. Fish within 15 yards of rail, marlin at net margin along net margin.

1430: Porps still in same position. Breaths explosive and obvious, spray of water with each.

1434: Good backdown configuration. 120 yard finger, porps out oward end. Chite marked by three buoys in two sets.

1441: Porps clustered at three buoys 20 yards from end of lobe.

1442: Animals at corks, maneuvered to end of channel, some going over. Almost immediately there's a release there begin long swift leaps and racing away. Jim Coe helps last few over corks. Fish out to end of backdown channel, easy to make a mistake. Ponga boat operators slap channel with ropes to drive fish back. 45 tons. 115-120 animals counted. No deaths.

October 15, 1976

Enroute Rendezvous with David Starr Jordan, 113W, 13N

Finally, at 10 this morning we made contact with the *Jordan* and laid plas for a meeting tomorrow morning early. We were able to lay their concerns to rest about plans (most of the details had been left unresolved when we went to sea, and the planning has been done here, between the four of us in charge, as it should be. But, nonetheless, the people on the *Jordan* rightfully had some concerns by being left in the dark.

The weather is flat—only a low, rolling swell sweeps across the glassy sea, under big puffs of cumulus; flat bottomed and often dark-skirted with rain. There have been very few birds today—a few boobies and a few petrels. Two young masked boobies circled us for a time, taking advantage of our propensity for flushing out flying fish. These swift birds watched as the fish burst from the water then flew in their wake, often catching them in midflight. I saw one caught just as it burst from the water, the bird having chased it through the water surface.

One killer passed us today—I find Bill Perrin has many records from the fleet in this area, and has seen them take a spotter in the wake of one ship on the tuna grounds. I had considered them rare in the tropics, but it's the more likely circumstance—they're rare or absent in areas of low productivity and these are rich seas. A couple of spotter schools were passed, unattended by birds, and Manuel dismissed them as not being worthy of being set upon. I was ready to let him take another set, and we may yet, because we will reach the rendezvous point this evening and there is plenty of time for the fishermen to make a buck. It makes them happy not to pass up fish, and it educates us—as long as it doesn't hold up our program.

We will have a meeting first thing, on our ship, and then quickly go to set No. 1, which is a water set, for acoustic calibration. This involves dropping a hydrophone from the helicopter, and making a set around it, and other details.

The crew loosens up. There is a language barrier with a number of them—many came from the Azores in their youth and all rattle on in incomprehensible Portuguese. But, we washed dishes last night, and make jokes with them when we can, and tend to our business, indicating we're here to do a job, just as they are, and they appreciate that. Jim's a great asset. He knows the fleet well, and has their confidence, saving porpoises, helping where he can, and such. I've been making progress too, but haven't been up to par, with my belly ache, and then my position makes it harder too, but, in time we'll get to know one another. Warren is amazing. In his very quiet way he knows about most of what is going on, and I suspect the fact that he's pretty grossly overweight doesn't make

any difference here, as a number of the crew are the same way. Sandy, the very sharp engineer is absolutely mountainous—sitting propped up in his corner by the coffee maker at meals, with one arm on the coffee bench and his big body leaning on both walls of the corner.

Last night the roll-up turned out to be a bear. It was very long and when rolled through the block they couldn't get it undone—the lead line all tangled with the rings and ring hangings. The net had to be lifted up in sections and manhandled by as many as 7 men to pull it loose. At dinner they were all despondent, thinking it could only be undone on a dock somewhere (Socorro Island?) but at some time after 11 PM a cheer went up and they had solved it. Everyone was covered with grease and dirt from the cables. There was little thought about food—Pope, the cook, had the noon meal ready about five times, but no one came in. I guess he gets used to that. He's a little busy bird-like man with an Adolph Menjou moustache (his real name is Alphonse), and thus far he has been unfailingly cheerful.

This vast comfortable ship is a real working vessel when she gets going. Every piece of gear has its place and is well planned. For the most part the crew know what they are doing, and get yelled at venomously if they don't. I'm impressed with them.

It's hard to realize one is at sea. You can walk the corridors without threading a hand on the bulkhead. The roll is only slightly apparent. We've had some winds and modest seas and it never seemed to affect us. I'll write further when we hit real seas and winds, which we pretty surely will have somewhere along the line.

I finished *Shogun* today and can turn my attentions elsewhere . . . a bloody book, but engaging.

October 16, 1976

Rendezvous with D. S. Jordan

We met the *David Starr Jordan* and early in the morning called over (about 7 AM) to find that their union radio operator doesn't operate before 7:30, and that one can't get them to put a boat in the water without 90 minutes notice. The crew of the *Eliz CJ* was scornful indeed, in loud and obscene terms, largely clouded in Portuguese idiom. But, finally we did get through and asked everyone to come aboard our vessel. Some had been pretty seasick—such as Bill Rogers, and Dr. Aubrey, the bioacoustician, but were now coming around. They had spent 2½ days at Clarion Island and had a good time there walking beaches, finding a turtle breeding colony, catching the big *Urosaurus* that lives there. Ed Mitchell was along and recording everything, as usual. He walks with a tape recorder in one hand, a little 35 mm camera in the other, a notebook in one pocket, a watch strung around his neck, and a drawing pen also slung around his neck. Nothing goes unrecorded.

Our meeting was a good one, settling many issues for everyone, and getting the program on track. The two photographers spent much of last year working with Cousteau and seem like pros. I distributed various orders, concerning film, picture taking, safety, and had some good talks with Dave Holts our man in charge on the *Jordan*. He's a fine guy and seems like a good choice there. I also spent some time with Bill Rogers, finding him relieved about fears over safety in the net, but happy that I tried to put safety as a first consideration and data wholly secondary.

Dave will get a tender from the *Jordan* and thus will be able to act directly as a buddy to Bill, which, I must say relieves me greatly. I, too, had been worrying a bit about that operation inside the net. The forces are great, and the chance to tangle serious, especially in the areas with 4½ inch mesh.

The following is a log of the Acoustic Calibration Net set. It consisted of the whaler from the *Jordan* going off a distance, deploying a hydrophone and a sonabuoy (broadcasting to the *Jordan*, where Ljungblud was recording), with first the ponga boats circling the skiff, and then the *Elizabeth C.J.*, which then set on the skiff. It stayed in the net for a time and then went over the corkline to record ahead and on the opposite side of the *Eliz. CJ* before tethering to the corkline at the backdown area until backdown was completed. No divers were in the water, and no attempt made to observe otherwise.

I plan to observe the tuna porpoise bond later from the helicopter and spent a little time talking to Joe Jorge about it. He describes it this way—at sea the tuna may be seen in groups below and behind the porpoises, or sometimes to the sides. One sees them by the brassy color they give the water, and by the glints from their bellies as they roll in swimming. He demands that I estimate the tonnage for him when I go up. In the net he says they follow the porpoise, and if there is a lot of tuna they may form a circle around the porpoises as they swim back and forth. Only as the net shallows do they leave because they are deeper and the porpoises tend to slide into the shallow end of the net. The tuna hit the net as it slopes inward, and sometimes become frightened and leave the porps, but not until very very late (in backdown, actually).

He also describes aggregation behavior, mentioning that tuna will gather around tiny bits of flotsam like half coconut shells, styrofoam coffee cups, a dead porpoise, a sick porpoise, whales, blocks of wood. The tonnage is not correlated with the size of the surface object at all, but one may pick up huge hauls from such things—120 tons sometimes. How very peculiar. I think the aggregation process itself may give a clue to what is going on—it may be a serial thing, in which the block of wood collects invertebrates, larvae, or whatever, and these collect small fish, and these other fish, or birds, or whatever, and finally tuna, who may attract each other. The functionality is obscure.

Well, I think we have good people here, and think things will come along.

The news came through about the closing of the fishery due to exceeding the porpoise kill quota—as of October 22nd and 0001 hrs. the fishery is closed and the boats can either take the observers ashore at various ports and cease porpoise fishing, or they can leave them aboard and cease porpoise fishing. the fleet is put in a peculiar stance—one that invites—almost demands, poaching. The foreigners, especially, I am told, Mexico, continue to porpoise fish, and kill porpoises in large numbers, and even violate the CYRA in the process. Our people are thus penalized in competition with them. Our people also face a peculiar situation in which the best boats—the ones that are careful and skillful and don't kill many porpoises are being penalized by the poorer boats who don't care, or don't know how to save the animals. The rule carries with it no incentive to do better, only to jump ship and go foreign. I think there is a way that could reverse some aspects of this. If, for example, the US fleet was classified according to kill rate into two classes of boats—first and second class, then it might be possible to divide the quota so that everyone could fish on porpoise through, say ¾ of the quota, while only first-class boats were allowed to fish on the last ¼ of the quota. This would provide great incentive

for all boats to improve their performance, and I think would uncover dozens of little stratagems for saving the porpoise that only the fishermen understand. We could have a race to perform better, and there would probably be an economic weeding of the fleet into better boats. There would also be much peer group pressure generated that would drive everyone. The quota would come to go farther and the porpoise schools would come to benefit, the US season would be extended, and I would hope, the example of the US fleet and the methods it develops could be exported.

The designation of the Interamerican Tropical Tuna Commission to house the international effort to save the porpoise is another example of putting the wolves in the henhouse. Above all organizations the IATTC is fish oriented, and bitter at NMFS for its work and restrictions on behalf of the porpoise. Wouldn't it be better to somehow divide the IATTC into porpoise and fish arms, and give each some control, but not total control? Thus, if the tuna arm became strongest the other would have recourse? It seems to me that setting these units against each other, with power to regulate take, would be better than hoping for some miraculous transformation of IATTC into a group that gives a damn about porpoises.

Well, things are loosening up. I can joke with some of the guys now, and not have them fall flat. It's coming. It's coming. I don't know if they will ever realize what my place is, or the place of Bill Perrin or Jim or Warren, but maybe it's better this way. It's too complicated to tell them what you are fighting for, and why their representation in congress is brave, and foolish, and why they're losing the battle, both at home and at the international level, and why the bureaucracy does what it does, and how the whole thing fits in the world as it is becoming. A complicated skein, and beyond most here, maybe all. No wonder some say, "Let's get in and get while the gettin's good, cause it ain't gonna be here tomorrow."

Clipperton Island, Pacific

We're lying to in a flat calm night after a good and complicated day. The night is dead calm and the ship is waiting for the morning to come so they can go fishing and still rendezvous with the *Jordan* early.

The day has been consumed with the orientation set, and a good one it was too. We had had a review the night before of what was coming and the morning we had a change of personnel, with me going over to the *Jordan* because I was to work on the glass-bottom boat when the time came for a set. This was to be an orientation set in which various people could learn their duties. The next one after that will be a tagging set, followed by two sets on the schools we have tagged.

The *Jordan* is built on the design of an older tuna seiner—with a lot of deck house going up to a flying bridge where the spotter scopes are mounted. These are 120X scopes held in bungee cord so that they take up much of the roll of the ship and it is pretty easy to scan the horizon with them. But, like all glasses, they make me seasick in a remarkably fast time. Ahead was the *Elizabeth C.J.*, looking remarkably sharky—very slim and racy, with her big skiff tucked up aft on the net pile.

October 17, 1976

Clipperton Island, Mexico

The *Jordan* is very neat, very well equipped and I found the crew friendly. One of my old shipmates, McLaughlin from the old Scripps days was aboard and we had a good time talking. He was one of the group in Turtle Bay, years ago, who got in a big hassle on the beach, got pretty drunk and came back to the ship all eight of them standing up in the skiff with about 2 in. of freeboard, singing at the top of their lungs. ("She had a dark and roving eye yi yi.")

We followed the *Elizabeth C.J.* most of the morning, had a big lunch and then in the afternoon the little bug helicopter found schools of fish and porpoise and they decided to make a set. By that time we were ready to do our work. I will go out in the glassbottomed boat to observe in the net (really to see how well the BB works). It looked nice—a Boston whaler with a compartment below with plexiglas in front so one can lay flat with your eyes about two ft. below the water. It take a 30-horse engine to push it along but it moves nicely.

Anyway, the following is a log of the set.

1354: Ponga boats, and porpoises passed the *Eliz C.J.* Lots of birds, mostly boobies (masked, browns, red-foot)

1403: Net in the water

1450: Glassbottom boat halfway across the corkline near future backdown channel; large school of porpoises, maybe 500 animals. Rogers with trouble with face plate. Porpoises near the *Eliz C.J.* and being driven over to the side near her by our activity. Dave Holts in, with snorkle. Leak in viewing chamber.

1459: We come over cork line moving in net with a single oar. Moving toward central area of net. Tuna seen. Swimming as deep as I can see—75 ft. or so, circling, coming within a few ft. of net. Porps aggregating near *Eliz C.J.* Ponga boat working to prevent collapse.

1508: Toward center of net, tuna moving as far down as I can see, circling. Plankton in water, can see about 60 ft. Porps swimming in tight groups, facing in same direction, all spotters, diving down and emitting long streams of bubbles. Tuna in the area do not seem to be following the porpoises.

1515: Have to leave the net, the corkline is moving so rapidly and under such tension that we can't get glassbottom boat over it, have to move to opposite corkline. Porpoises swimming deeply in backdown channel—much vocalization, nearly every animal is squeaking and emitting long streams of bubbles in the process. All spotters. Animal sinking tail first. Subgroup structure very obvious. Occasional individual animals. At time a sort of warp and woof can be seen, with subgroups swimming through one another in opposite directions (all diving or rising at a slant). Most animals are nearly vertical. Independent school of tuna going by, much more rapidly.

1516: One porp hanging at the surface with tail hanging down. White tips on spotter snout very evident. Dark genital spot very obvious. Some animals below me lying [?], not in trouble, but lying on the slope of the [?] below me. Some animals sinking tail first, not in any trouble. It seems more like a frustration maneuver. Spotters being swept past me hanging nearly vertically. Tunas swimming swiftly among them without obvious reaction. Some porps lay very deep down on the net—without the panel they would probably die, but they truly are not drowning, only frustrated. Spinners seen. Swift tuna go by, purposefully.

1520: Spinners going by, saw one swim into another and stun the other, partially knocked out, sank and then recovered. Mass of tuna going by.

1523: No more porps seen. Dense fish schools, can see opposite wall of net now visible.

1525: Channel now very narrow but fish still go by. Dave Holts: adults and subadults, not neonates, would have less than a foot interanimal distance, while coming up to take a blow, and then continuing on another dive. Really close together.

1526: Net bellied out under us. Tuna with bright yellow corselet fin and a gold lateral bar with an iridescent blue line above and the sharp long anal, ventral fins all bright lemon yellow—obvious signal systems as they are the things one sees farthest away. Very bright, almost fluorescent. Tuna travel with mouths open, as one would expect. Seven dead porps. One spinner and six spotters, caught at three bow bunch.

A few more general observations are in order. First, the reaction of the porpoise school seems to be a sort of averaging of the disturbances from all directions. With us thrashing around out in the net away from the *Elizabeth C.J.* we drove the porpoises toward the seiner. Every new disturbance of divers, skiffs, motors, whatever, tended to deform the school and move it. We succeeded in forcing the porpoise school out of the backdown channel and Manuel was screaming Portuguese oaths from the bridge. The porpoises that died were caught in the third bow bunch of corks, probably because of our actions. Otherwise the porpoises would have never approached these corks and entanglements.

The vertical and passive hanging of the spotter, I suspect, is their salvation in comparison with the spinner. They are swept out the backdown channel passively, many quite deep in the net lying passively on the webbing. I'd guess that the new Bold Contender system is a great help as much as anything because it provides a rampway up which they can slip. The new modification, especially, which allows the animals to pass out of the net without meeting any angles or corners—nothing but taut webbing.

Spinners, on the other hand, dart about and swim much more horizontally, in my brief observation, thus ramming the net, and if it can catch them it does. This swimming loses its coordination once the animals are in the backdown channel, at least in large part. The blow I saw one spinner deliver to another seemed inadvertent, but it was hard enough to temporarily stun the recipient.

I am curious about the startle reaction of porpoises at the exit from the net, as they determine they are free. How do they know they are free? Are they echolocating? Do they simply sink deeply enough that they find there is no net beneath them? What is it about their environment or senses that says, "Aha, there's no net around me," and then they take off. If we know this it might be possible to design ways of generating that same adaptive flight response in animals in the net, to, say, let them flee through a depressed section of corkline from which the tuna are somehow excluded.

The glassbottom boat is fine, but its glass area is vulnerable and there are problems in removing the ballast without making it unstable. On a shore, I'd take it into shallow water and take ballast out as the boat was inched into shallow water. Damn, I wish they'd built it like I asked.

[Drawing of Clipperton Island]

October 18, 1976

Clipperton Island, Off Mexico

Last night we moved down toward Clipperton, with the notion that the crew would go fishing at dawn, and then return to meet the *Jordan*. I thought they would go in the pongas, but lo and behold, they used the big net skiff, and everyone could have gone, including me. I was pretty tired and welcomed the sleep since I'd been at notes until about 11 the night before. But I did rouse myself just as dawn was streaking the horizon to look at Clipperton. I could see the net skiff moving in close to shore. The island is almost circular, with a few scattered palms and a brackish interior lagoon (with fish, I'm told), and in two places what look like rock piles sticking up maybe 70 feet. There was one wreck jutting from the sand. I'd guess it's about five miles across, a thin circular ribbon of sand that must be awash in a hurricane. I think it's French. A lonely lonely spot.

The crew and our people came back with an enormous load of fish—mostly serranids, *Dermatolepis* the major form, a couple of Rainbow runners, a few *Ulva*, one Chirritos, an eel, a helluva pile of fish in two hours.

Later in the day, we rendezvoused with the *Jordan* (later than we had planed) and began to search for animals for a tagging set. Not long afterward we located a school of about 600 animals or so, mostly spotters and some spinners. We had spent the morning getting ready, Bill Rogers had worked most of the night on tags, and we worked hard to crimp some loose wire ends on them that would create havoc on the animals, and to cover them with plastic tape. These are braided in three or four colors, and have numbers. At the same time four radio tags were readied, including one depth of dive tag. Things got a bit frantic toward the last as we waited for skiffs from the *Jordan* to come over to pick up our tagging teams, who would then tie up on the corkline. One of the engines wouldn't start, and the skiff for Tagging team A was lying unused at the side of the *Jordan*. A big of frantic calling and we got it freed so we could run alongside and tow it around to the backdown area. Later one of the Avon's engines gave out and that too had to be towed. Nonetheless, we were able to get all skiffs tied alongside the backdown channel and prior to backdown itself. Fortunately it was a nice calm day, cumulus clouds on the horizon, and about a five-ft. swell running with no wind. As backdown approached we were all ready, tags beginning to be lined up and numbers and colors recorded prior to being placed in animals. Bill leaned over the bow, his knees on the rough non-skid strips sandpapering them down unmercifully. I recorded, while Warren prepared tags and called off numbers and colors to me. It got pretty hectic but nonetheless we got out all but one of our tags, in contrast to the other team that had 22 left. The radio tags were successfully placed, and the *Jordan* began recordings. I think three animals were lost and some 25 tons of tuna taken, which keeps the whole operation well above the fleet average. There were estimated to be some animals in the net. All in all a useful operation, and now the *Jordan* is tracking the radiotagged porpoises and we plan to set on them tomorrow.

Tonight a 38th birthday party for Joe Jorge, a noisy, gregarious, skillful guy who has the respect of everyone on board. He works like hell, and sets a beautiful net, and doesn't kill many porpoises. He knows where the fish are, how to see them, laughs when five tons go over the net, but pushes onward to more and better sets. A fine fisherman.

I've been interested in the way a set works, because apparently no other fishermen, other than the Americans and a few of the Mexicans can make porpoise fishing work. Here's what I see. The school is sighted, usually by birds over the horizon,

and on this boat, by helicopter. Often the skipper goes up in the helicopter and makes the set by radio, or from the mast. Everything is done at high volume with speakers blaring all over the ship. There's almost no escape from them and I suspect all these guys suffer from a hearing decrement. They play their audio on the films they show at full blast, and the winches, etc., outboards, etc., make ferocious amounts of noise. Anyway, once the school is located they look for fish. If they see them they move in, launch the speedboats (on this vessel I've never heard the word Ponga). These deploy out to the side of the vessel, going in the opposite direction from it. They deploy in a J, with the rear boats forming the hook of the J, and the two boats the straight part. The porpoises are between the J and the *Elizabeth C.J.*

The speedboats and the *Elizabeth CJ* at the start are maybe a mile apart or a little more. The lead speedboat feints in against the running school, which may be diffuse, or more likely running into long, broken groups.

October 19, 1976

At Sea

The man running the set causes the J, and the *Eliz CJ* to sweep around these animals as the chase continues, gradually, gradually, over many minutes time, turning in on them. This is done by feinting at the running school with the lead boat (but never running in front of them), so that the porpoises run in a broad arc, gradually turning. The *Eliz CJ* gradually turns too, in a slow spiral that may take an hour from start of the run to the set, inward ever inward on the animals. She acts as a noise block to the animals retreating in her direction. The relative positions between the *Eliz CJ* and the speedboats never changes, but instead the whole group rotates and tightens as the porpoises turn. Finally, when the *Eliz CJ* has spiralled into the extent that the whole group of boats equals the diameter of the net when set, she lets go her net. This then blocks the porpoise flight from that direction while the boats continue to block it on all other sides. The porpoises then sense the net, and with the feinting lead speedboat no longer harrying them, with noise at the rear and side, they slow and mill, while the set finishes encirclement. Speedboats stay outside the open part of the net until the net skiff pulls it along the side of the *Eliz C.J.* and the purse lines from both sides are put on the winches. [Drawing.]

We carried out a tagging set quite successfully, in spite of some glitches. Four radiotags were placed—one depth of dive and three radios only. And about 60 dart tags were placed from two skiffs. The skiffs, Boston whalers from the *Jordan* were tied off on the corkline alongside the backdown channel, on each side, with the radiotag Avon raft at the apex of the backdown channel.

Our dart tagging team consisted of Bill Perrin, Warren Stuntz and myself. Perrin placed the tags, Warren loaded them, and I recorded. It was frantic. Bill shouted out the species, age class, sex, while Warren gave me the color of tags (up to four colors) and the number. Only because he sacked up as many in advance as he could was I able to keep the recording straight. We placed all but one tag. Estimates of 200-300 animals, mostly spotters, were given (25 spinners). The radiotag team got their radios out, and we repaired from the scene, satisfied. The ship took about 28 tons of tuna. No sharks. But, two of the motors hadn't worked (the skiffs had to be towed in at the least minute), and now, this morning the depth of dive transmitter has cut out, and one ADF has quit. And

the signals reported from the *Jordan* are very faint and they have called us off our fishing to see if we can help locate the school. We're moving in at this time, our skipper grumbling but complying.

The weather has been holding beautifully, light breezes, puffy cumulus and an occasional rain squal, but not too many, and about a 4-5 ft. swell. Easy working in the water. I forgot to make a note of a couple of behavior patterns seen by Joe Thompson and his son (also Joe Thompson). They saw a group of spotters facing each other, mouthing and nipping at one another as the net was being closed down (before backdown) and Joe Sr. had one adult spinner come at him with its jaws nipping, rushing at his throat. Joe fended the animal off with the camera, but did not think he got photos of the incident. He did feel he had photographed the nipping group. Joe Sr. also mentioned that he had observed tiers of animals in the net, a surface layer, a layer below it containing something like 1.5X as many animals per unit volume as the surface, and a third tier, deeper still, with maybe 2/3 the density of animals as the surface. These groups rotated to the surface to breathe.

I wonder if some of the splashing and thrashing that seems to come up in frequency as the net comes in represents this release of aggression, and if the aggression may in turn be released by crowding of normal school patterns upon one another. In other words, the structure of a normal school I expect to be ordered by aggressive encounters between animals. In this way mother-young groups might be rounded up and ordered, spacing of individuals and subgroups regulated, and perhaps school direction determined. When animals are crowded these patterns start to disappear and aggression rises? Who is being aggressive? Who is the recipient?

The following are tape notes from Experimental Set 9. The tagging set of yesterday went off well enough with most tags placed and four radiotags out, including one depth of dive. A frantic exercise at the end of the backdown channel with Bill Perrin tagging, me recording, and Warren Stuntz loading tags and shouting out numbers to me. After the set, which netted about another 15 tons of tuna, the *Jordan* team tracked the animals for much of the night, but lost the regular radio tags early, only keeping the depth of dive transmitter in contact. At about 3:15 AM the surfacing rate speeded, as if the animal was breathing fast, and then a couple of fitful signals and then nothing. I think it died, and suspect the first radios failed because of a flexible antenna that lets the antenna get swept backward as the animal swims. I doubt that OAR has tested them on a porpoise. Anyway, nothing, and no sighting of the animal. We tried all day to reacquire the signals using the helicopter and both boats. No luck. In the afternoon we let the *Elizabeth C.J.* make a plain fishing set, and it ended well after dark. Here are the notes.

1718: Speed boats in water adj to reasonably good-sized school of mostly spotters.

1739: Porpoise already beginning to mill. At 1/3 net.

1735: 1/2 net, porps well into net now, they are trapped. Swimming toward the mesh, backslap, animals moved at first swiftly toward the net when 200-300 yards slowed down at 150 yards of net, backslap, slowing, don't approach any closer, blowing unobtrusively, dense school 75 yards from net, as far away from us as they can get. Net almost closed. Constant tail slaps from a single animal across the 300 yard diameter. Net skiff moving direction under me. Purse line being taken in below me. About 100 yards of

net remain to be taken in. Speed boats are in the midst of the opening. Porps are as far away as they can get. Animals in tight school slowly.

1740: Swimming in a mill, rotary, subgroups going the same direction but other groups going the opposite direction. Approx 80 yards from far corkline. To the left of the backdown buoy. Slow swimming, simple forward locomotion, recognizable subgroups. About 150-200 animals, backslap.

1745: Net closed. Purse lines coming in rapidly. Tail slaps and head slaps, school seems more agitated, suspect rings make noise as purse lines come in.

1749: Animals all swimming in one direction toward the bow of the *Elizabeth C.J.*, as far away from the vessel as they can get. Sun is setting, clouds are all pink, reasonably bright. Will be dusk before backdown.

1752: Animals still all moving in the same direction (indicates an underwater mill or return). I saw a couple of head outs. One about up to pectorals. Even though school moves individually toward bow, the school as a whole doesn't move. Some animals at leading edge seen turning. Increasing number of animals throwing their flukes as they dive. Graduated tail slaps.

1754: Backdown channel almost in position. Net still circular. Bow bunches, but cork line simply curving.

1757: Some confusion, animals running into another, and white water.

1759: Nose outs increasing. Almost with rings in. May get pretty dark.

1800: Backslap.

1801: Struggle, animal throwing its flukes sideways, as if trying to perform tail slap but missing the water. Racing near corkline. Thrashing. School strung out along corkline 30 yards out.

1802: One lone tern seen. Porps spread out 30 yards from corkline in long band. Moving slower. Occasional subgroups.

1806: Considerable numbers of relatively explosive breaths.

1807: Considerable numbers of nose outs as if the hanging behavior is coming now.

1808: Animals against the corkline in some places, but as usual most are 30 yards away.

1812: *Dave S Jordan* coming around the stern.

1814: Quite a number of individually moving animals.

1815: Rings up. About to go on ring stripper. Duskish. Masthead light shed nice bright patch on water. Aggressive encounter, animals ran into each other and much white water.

1815.45: Melee, many nose-outs, lying doggo in the water, milling continuing. Animal poked head out of water and wiggled as if beating flukes. Many toward bow.

1819: Animals in long narrow group, most conc. near backdown area, but extending 80 yards or more toward stern of vessel. A 30-yd. gap still evident. Fish against the corkline.

1829: Blind set in that helicopter was on deck.

1830: Porps conc. in direct area of backdown channel. Net half the length of the ship, 80 yards out to far corkline. Still no major indications of fish. Porps in tight group right at backdown channel. In subgroups that dove rather agitatedly as net shrinks.

1835: Porps in very tight group as we move into backdown. So far, a perfect maneuver. Hard to see if Manny is going to lose fish. No bends in backdown channel. Frequently breaking surface. Staying away from both sides of channel, and from skiffs. Whitetip outside the net, swimming under backdown channel. 6 ft.

1841: Some porps are out already. Can see them breaking water beyond the net. Leaps start 30 yards or more from net. Most porps out, a few left.

1843: Quite a school of tuna up toward us, all breaking water in close to the boat. Tremendous thrashing of big fish up near vessel. Backdown continues. Milling mob of fish all swimming up against the current in disoriented fashion, many on their sides over the mesh. Hard to see in the net.

1845: Still backing down. Fish clear out toward skiffs. One crew member jumps in and walks on net out toward backdown area. Channel 25 ft. across.

1848: Backdown seems complete. One speedboat member seems to have fallen in at the end of the backdown channel. He's out and OK. Backdown channel completely closes.

1856: A few porps located at very end of channel, but now they're out.

1900: All out.

October 20, 1976

At Sea

I went to the *Jordan* early to prepare for a standard set, to do some observations on the glass-bottom boat of the backdown channel. Dave Holts and Bill Rogers are scheduled to dive in the net, Joe Thompson is scheduled to fly over the set in the helicopter, both before and after, Bill Perrin and Ed Mitchell are watching aerial behavior, Jim Coe will watch net and school shape.

At any rate, at about 11:00 a school was sighted, the helicopter put up. The following is a log of the set:

1148: Helicopter over school. Supposedly good fish; this set was interposed because we were unable to recover our tagged animals from set #3, yesterday. *Eliz C.J.* ahead a mile standing by waiting for photographers to get their photos of the unnetted school from directly above. Will launch diving team etc. as soon as the net is out.

The day is very calm, flat, hot, scattered clouds on horizon, no rain squalls, 9 kt. breeze, scattered white caps, 6-7 ft. swell, ESE wind.

12:10: Speedboats in water, helicopter over school.

1246: Net let go.

1251: Set complete, we come up behind. A very long period getting our boats in the water. The bosun moves like the second coming of Christ. He literally wouldn't start on the launching of the glass-bottom boat until the bowline had been cast off from the acoustic skiff, even though there were three guys standing around.

1321: 30 At corkline of backdown channel. Tied GB up with about 2/3 of bow into net at the middle of the backdown channel.

1327: Divers skiff (Avon) now in net and circling around the bow portion of the corkline. GB tied off. Nothing to see underwater from my vantage point, but net walls going down out of sight. Porps a long way off (80 yards est) in center of net. Est 250 animals, mostly spotters. Helicopter came over—100 ft. Animals reacted by moving toward the *Eliz C.J.* Much noise and downdraft. Porps in a mill in which they swim

parallel to far corkline (from *Eliz CJ*) dive at one end and mill back again underwater. Some throwing their tail stock into the air and thrusting out their heads.

1328: No animals seen underwater.

1335: I saw my first porpoises off in the distance just at the very edge of vision. They are beginning to move closer to backdown channel. Acoustic skiff has left for some technical reason, leaving me alone at end of backdown channel. Divers at center of porpoise school, with school forming a circle around them. Many are back of divers toward *Eliz CJ*, (I call divers and tell them to move closer to *Eliz CJ*).

I'm in an increasing lobe of net with animals out in front about 70 yards. Can't be seen from GB.

1337: Animals forming an almost perfect circle around divers again. A few animals, including a very young spotter, still not adequate viewing. Still see an occasional animal that must be on the periphery of the school diving near me.

1340: Just at limits of vision can see animals. There's a rather large lobe of net at the end of which is located the BB. Porpoises don't like to enter such lobes, so little can be seen. Some animals (spotters) right ahead of me, swimming nearly vertically downward (probably 70 deg.), going down perhaps 30 ft. below the surface, turning and twisting spirally as they rise to the surface again, swimming around one another—a group of 7-8 animals (spotters). Now another very tight group of 7-8 spotters in area, and some drifting singles, or slowly swimming ones. All swimming, except for some by spinners, is very slow. Tiers of animals evident, a lower tier which I believe to be spinners and an upper tier almost wholly or wholly spotters at my level or just below me. An adult male spinner with a large white splotch on r. side of its tail above midline (can see enlarged postanal hump). Mostly spinners in front of me now—some as much as 80-100 ft. below me at limits of vision. Some directly below me coming very close to net (10-20 ft.)—spinners probably.

1343: Quite a layer of slaps 70 ft. below me, more or less continuous but scattered. Tellya what!! It's mighty goddam hot in here.

1345: Porps at very limits of vision swimming near vertically, two animals spiralling upward in their peculiar arabesque. Another group (5-6) diving absolutely vertically so far as I can see, down to about 35 ft., levelling off and fading into distance.

1346: Backdown buoys coming up to power block, can see cork with 250 ft. to go. No major groups of porpoises. Ponga boats coming up (2) to help tend backdown channel. Animals still conc. in center of net, at very limits of vision—maybe 100 ft. away.

1348: Helicopter passed 100 ft. overhead, helluva racket, must be terrifying to animals.

1350: Backdown corks aboard. Backdown about to begin. I can see a few animals at limits of vision. Some animals very deep in net—just as deep as I can see (70 ft.?). Helicopter noises. Spinners deep below in a milling horizontal group, all pointing the same direction like a fish school. Moving very slowly. Some tuna evident now. Porps way below tuna in very tight mill, deep down backdown channel. Spotted porpoises near surface following one another to surface in twisting mode. Most spotters move nearly vertically (70-90 deg.) either up or down. Mother-young pair of spotters, baby pure color and in clear assisted locomotion mode—tight up against mother's dorsal surface, a lone spinner goes by, phonating. A whole group (spotters) (6-10) in nearly vertical arabesque

to surface. some others hanging more vertically down 30-50 ft., phonating (bubbles streaming from blowholes for a second or so). I can see mother-young pairs of spotters swimming below me in perfect unison.

Helicopter over me—scarcely any reaction. Backdown underway. Animals are being pushed up against the net by strong current. But able to swim out of it all right. Net slopes in a curve from nearly vertical at corks curving down three ft. to 80 deg., 70 deg. at 7 ft., to 60 deg. deeper below me. Animals are pressed against the webbing, but not very tightly. An animal can be carried along if it chooses not to move, but modest movements break it free and allow it to move up. They wiggle up the slope to the corkline, and are sluiced over. I'm surrounded by porpoises now. They are in the process of going over the line. They hit the bottom of the corks and struggle over. (Interrupted by a call from the speedboat in choice Portuguese-English via the bridge, the freight of which is that I'm about to sink and the skiff is holding up the corks for the backdown isn't going as normal. Remember I've lashed the corks to both sides of the skiff).

1355: Cut the lines loose. They were taut as fiddlestrings and snapped away with the first touch of the knife. The skiff wasn't down though, there's too much buoyance. I'd secured the bow painter to the corkline and thus could let myself out a distance from the channel to see animals come over it. I was tied up maybe 15-20 ft. beyond the corkline which now began to depress in a rather deep arc. One of the first over was a spinner mother-young pair. The baby, a plain-patterned near-newborn, was in a state of semi-shock. It swam listlessly and undirectly while its mother hovered near. Other porpoises rocketed by, but the mother still stood by in front of me. Finally the baby began to stroke and rather swiftly put it in high gear and the pair raced off. They took off at an angle from the net opening and downward at about 35 degrees.

Animals pour in gouts out of the backdown channel, and like racehorses out of a gate, are in high gear even before fully out of the net at times, and all go under me at the 35 deg. angle downward. Subgroups structure is not evident at all—just individuals or groups individually getting the hell out of there, at the same 25-35 degree angle downward. With me no longer holding up with the GB I can see clearly the end on view of the backdown channel. It is about 20-30 ft. across and perhaps 6-7 ft. deep at its center—much deeper than I had expected from surface views. The current in this opening was considerable. Streams of salps and jellyfish showed it clearly as they sluiced up the net inside and poured out in a visible stream to dissipate some yards beyond the opening. The backdown persisted for what seemed like several minutes (my tape recorder quit). Not a tuna escaped that I saw. As the animals emerged one could see them readying for burst of speed and the long dive as they headed up over the corks and into the open sea. The impression I gained was that they knew freedom was ahead while they were still in the net, and that spotters helped their own case by taking it quietly, while the spinners, with their horizontal swimming could get into more trouble in net folds and simply by hitting the mesh. If the mesh were larger I'm sure they would be in trouble. Philippe Vergne reported that he thought he saw a group of five or so spinners dive through the rings earlier in the set, and come up outside among the skiffs, and stay near until backdown was done. [Drawings]

October 21, 1976
Clipperton Island

Another island for the life list. Today was Clipperton Island day. The weather was pretty foul outside, unfishable and the poor rolly old *Jordan* was doing her thing to the distress of the scientific party aboard, at least, so we headed in to the inadequate lee of Clipperton, which was about 10 miles away. Once there groups divided into those going fishing, and those going ashore. I chose the latter. It was an interesting day, with a bit of nail biting thrown in for good measure. We chose the landing place adjacent to Punta Croix (one searches in vain for a point at this location). Through the glasses we could see that a fringing reef ran along shore, behind which was a shallow maze of channels and coral or *Lithothamnion* mounds and projecting rocks, perhaps 200 yards broad, before one reached the beach. At the time we launched the surf broke on the outer edge, just as the island pediment dropped off into deep water. The ships stood offshore a thousand yards or so, and were in a hundred fathoms or more of water. Like most atolls this one drops precipitously down into deep water and holding ground for anchoring is sparse indeed, even if the island were big enough to offer real protection from the wind.

The speedboats took us just into the swell where the surf was about to hump up, and there we transferred to a little two-man rubber raft. Glen, the helicopter mechanic and I went in together. The paddles that Joe Battaglia had made for the operation were lost on the run before ours so we had to paddle by hand—slow business in the surf. Glen took the bow and I the stern. I double bagged and tied my camera in heavy plastic and tied it in the boat, and off we went. We got most of the way in uneventfully, and then one of those 7th or 8th waves caught us and swamped the raft with water. We paddled on, endlessly it seemed. Finally we bumped onto the *Lithothamnion* ridge (thank goodness for this unspiny stuff—coral would have been fatal). I was on my knees when we hit and bumped over the rocks through the thin rubber bottom—bumped the bejeezus out of one knee, which is swelled up a bit at this writing (next day). My Dodger's cap went flying and was lost. Unhitching the bags and my camera I could see that in spite of all precautions some water had made its way in—the pressure of waves in forcing water in is something. Guess I didn't have it well tightened or inflated. I'm told an inflated bag keeps the water out, while a collapsed one lets it in. Anyway, the camera took one slide and then quit.

I staggered up out of the water, bearing the bag with its little pool of salt water, and made for the shore over the tidal flat. A fascinating area too. Flattish mound-shaped rocks, all planed off at tidal level, and every inch covered with life—a band of tunicates banding the inshore edges of many rocks with a mottled white and pinkish, calcareous algae, extensive colonies of tiny (1/2-1/4 in.) anemones covering many feet of some rocks, and in between fish swimming in the channels—little black pomacentrids (with no white dorsal spot), butterfly fish, and many reef eels—a very light gray one being the most common. These two-ft. eels wriggled and flowed their ways in the shallow water almost everywhere one looked for any time. A bright orange and white smooth puffer cruised in front of me, and later I saw the brilliant iridescent blue ulua (*Caranx stellatus*) racing over the flats. Sea cucumbers were common with their respiratory trees expanded, most were black, with bits of white coral stuck to them, looking as if they had been dusted with flour.

I stumbled ashore, took my camera bag up under a small group of coconut palms nearby, undid the bags, drained out such water as I could and tried to assess the damage—no water inside lenses, but the battery case was full, and only one frame went

through before everything was dead. Too bad, the island is full of spectacular picture opportunities.

As I set the bags down under the low palms I noticed that everywhere were the bright orange land crabs—like a cancer crab, and about six in. across the pincers in the largest ones. They dug shallow burrows in the beach, under the fragmented coral that makes up most of the highest island, and under coconuts and other debris. I wondered what they ate, and whether they had to retreat periodically to salt water to wet their gills. For food, Bill Rogers and I found that they ate the green parts of palm fronds, running the individual veins through their mouth parts longitudinally. Few fallen fronds were left unstripped. Later, we found them feeding on cast booby feathers, running them the same way through the little clipping machines that left only the central shaft intact. Just before we left I wandered to the central brackish water lagoon and found them clustered in a speckled orange band along the water's edge, and even a few submerged below water, feeding on the fresh water algae that formed rafts there. The one on board ship ate meat, so I guess they will eat anything that stands still long enough, and to prove it, they began to nibble on me while I worked on my camera. I'd guess they would be a major menace at night, unless one had cots to repel them. Certainly a person sleeping on the ground would be inundated by them. They would crawl all over you, exploring, pulling parts of you, and your clothing toward their mouthparts. Why orange? Is it warning coloration? Warning for what? The grapsid crab of the Galapagos is orange too, almost the same hue, but it is delicious. If these are edible, one could scarcely want for food here, as the island is covered with tens of thousands of these crabs that wait only to be picked up. I saw one other species of land crab—a pinkish flatter and smaller form, that was very much less abundant. The crabs climbed everything—far up coconut palms, up planks and earth piles—anywhere they could go. What do they do when the hurricanes come and the island is inundated?

Inundated it is. It is a ring of coral fragments, and a lone fin of rock, around the edge of a spacious central lagoon. The coral is broken into pieces 3-4 in. long, with coral pebbles intermixed, pieces of the coral matrix that have been rolled in the surf into cobbles or pebbles, through which run rings or zones of growth, formed long before and broken off. Lower on the beach the coral flour forms the soft, almost powdery sand typical of coral atolls.

The waves obviously sweep over the entire island, save the fin, which projects nearly 70 ft. above sea level at Rocker Clipperton, and must be the only real refuge in a severe storm. One can see benches on both sides of this ring of land, formed when either the lagoon is high, or the waves break high on the shoreline. The slope of the beach varies from a gentle contour to piled coral fragments so steep one had to shuffle steps into the berm to climb its eight ft. height. Even so, quite an attempt at habitation has been made in the biggest palm grove on the island just west of Punta Croix. Here, amidst several hundred palms, are perhaps 7-8 buildings—a shower-lavatory, a big mess-office building maybe 250 ft. long with rooms on each side of a central aisle, and a double roof, and a theatre (the best preserved of all), the foundations of others including what may have been a generator plant. Now, a few years after the buildings were put up, they are rusting into oblivion. I'd guess they could still be salvaged in part, but they are dank tombs through which the rains come, and whose members are scaled with deep rust. In the galley, stainless sinks have resisted and the pots and pans still hang on the wall, some

old cans on the cupboard shelves, but the floor is slick with fetid mud, the air stagnant and damp, with crabs scuttling in the darkness. Outside the grove is filled with the downed skeletons of palm fronds, skeletons because the crabs have taken away every vestige of green.

The leaves have fallen so thickly that most places one cannot walk but only stumble and thrash along, over the fronds, amidst the fallen coconuts lying so densely that they are like huge ball bearings rolling under your feet. Above, the forest rocks with the shrieking calls and flapping of the noddy terns and boobies. Bill Rogers and I pursued some little lizards, and finally caught one in the coral rubble—probably the bronze skink, that successful traveler of the Pacific world that has made its way by flotsam probably, to many islands. Here it is dark brown, with a very long slender tail, that curls in loops like a wire worm when the animal buries itself in little burrows. Its scales are smooth and like other skinks, and its eyelid free. I believe I could see the movement of a nictating membrane, but could not be sure, and Frank Aubrey later told me he had seen an up-down movement of an eyelid. I gave him our specimen to preserve.

The central lagoon is vast, and I suspect the frequent rains have slid fresh water in such abundance across the salt that a fairly deep layer of potable water results. It's slightly brackish to the taste—maybe 5% salt or a little less. Maybe after one's intestines equilibrated one could live on it, but better, shallow wells in the coral would reach a freshwater lens and adequate water, I'm sure could easily be found. There must be a ring of such water around the entire island, and it must be replenished by percolation each time a rain passes. Rafts of green algae float in the lagoon, one at least like a *Nitella*, a feather boa freshwater form. The shores were littered with vegetation fragments like a thin soup, that turned everyone else away from tasting the water.

Birds, birds. These islets are often homes for fleets of sea birds, the flattops from which they launch their lives into the surrounding deep sea. I wondered yesterday to see flocks of cattle egrets flying by our ship out to sea, lit up by the boom lights, and looking so out of place here 600 or more miles to sea. But today we saw them standing alongside the lagoon. Bill Rogers is a capable ornithologist and together we wandered through a bird colony near the habitation. The birds, mostly brown and masked boobies, occupied a long bench on the lagoon side of the berm. They were obviously spaced, about 20 ft. between birds, or maybe a little less, being the average, and one could quickly tell why, as one masked boobie shrieked at another that dared to land too close.

Many had two eggs, white, sometimes stained with vague blotches of pink or brown. None that we noted had more than one chick. The chicks were in all age classes, from newly hatched naked little critters, about a handful in size, to ones just feathering out that stood as tall as their accompanying adult. They were protective of their young as we came up, and would not leave the nest until the last moment, usually even then not launching into flight—only the birds without nests flew at our arrival, and then sailed in on us, just above our heads, their flight magnificent and controlled, looking down on us from a foot or two out of reach, feathering their wings and spreading or shifting the tail feathers to stay threatening above us. Probably three calls were noted—and in my non-acoustic soul I find it hard to remember them. The brown boobies came in two color phases—one with a whitish head and neck grading into the chocolate brown of the neck and upper chest, where the belly white meets it at a sharp line. The feet are greenish yellow, to pale jade green. Another color phase sported an all-brown head, and seemingly

slightly lighter-colored feet, but I could not be sure of this. The masked boobies (which used to be red-footed boobies) are lovely white birds with yellowish bills, with a blue base, a black tail and wing primaries. They have pinkish or coral-colored feet. One color phase, seen occasionally, had pinkish bill color rather than yellow.

Several examples of the wonderfully stereotyped behavior of the adult-young pairs was seen. In the brown boobie, the young (half grown) sometimes put on a sort of spastic behavior, with the neck lolling to the side, and the wings held as if neural circuitry was in bad repair. But when I shoed the adult away the young regained its control and behaved exactly as a well-adjusted threatened young bird should. He glared at me, wings in place, with his remarkable binocular vision, eyes focused directly forward like a human's, or like a bittern, looking straight at me past his rapier bill. I suspect to get too close is to have that bill dart out and stab, probably at eyes, so I stood my distance. In another behavior a single adult masked booby postured, its head first down and then up in a grotesque stretching motion, not unlike the posturing of the gooney bird.

Bill saw a warbler on the island—perhaps an Audubon's, and together we puzzled over a bird that looked a bit like a tanager—a fairly heavy beak, that flew low to the ground in the palm grove. I thought the flight was a bit flycatcher-like, with little flirts upward as it landed, but had to admit the bill was too heavy and it did perch on low things. Yellowish green in color, with darker wings, a lighter throat, and not much else distinctive. Then, later, out by a lone palmlet on the berm top I saw what looked for all the world like the Nihoa millerbird, a little vireo-like bird, with a slim black bill, hopping about on downed fronds and peeking at me from behind things. It wasn't as nervous as a vireo or kinglet though. Don't know what it was. Oh yes, Bill and I also found an earthworm. Wonder how they fare when the hurricanes (chubascos) sluice water across the island? It must flood in shallow waves since the houses seem to have survived by being placed back of the berm on the slope down to the lagoon, and the large patches of *Ipomea* (beach morning glory) seem to survive only there. A wild sight, I'd guess, to be on the island then. A row of casuarinas had been planted at the edge of the grove and were doing less well. I'm suspicious that the colony was a phosphate mining group, because there were rails, and much machinery that might be used for such mining. (The buildings apparently were left by French missile tracking personnel, as part of the French Pacific missile range.)

The place is littered with flotsam, like most such remote shores—old planks, rope, netting, buoys, a few net floats (quickly scarfed up by the crew who went ashore), lots of purple glass, old rotting iron machinery, rails, barrels, old boilers, sheets of green copper, and so forth.

By the time we made our way back to the landing the tide had begun to come in. Water had flooded over most of the exposed rocks, and the waves were breaking a bit close in, humping up higher, I think, than when we came in. I wanted to get back to the boat as soon as possible to work on my camera, in hopes that I could save it for this trip, so took an early traverse out with Joe Thompson Jr. He's a taciturn, slim young man who is helping his father on this effort. We waded out, waist deep to the rocks at the edge of the break. By this time sharks (for which Clipperton is famous) had begun to come in over the reef flat and were skulking along parallel to the beach. As I waded out I stirred up much coral dust into the water, leaving a trail, and the local contingent of sharks quickly began to follow me, providing an eerie and uncomfortable retinue to have at one's back.

Needless to say, I turned around with considerable frequency to see who was nipping or intending to nip, at my heels. None did.

Anyway, we reached the raft, which was on a line run from shore to the offshore boat, jumped in, and very soon were being towed through the surf by the offshore speedboat. The method is quick but it doesn't allow for much finesse, and we fell victim by having a wall of a wave rise in front of us and crash down on us before we could cross it. I saw it coming and burrowed down in the raft and held on. It churned us mightily and threw my camera bags overboard (prudentially tied in so I retrieved them), but we were OK, and soon on board a speedboat that took me to the *Jordan*.

Bill Perrin had come back loaded with wonderful flotsam, a particular piece of joy for his junk-loving soul, Joe Battaglia, however, took the prize as he came in towing about five net floats, a bunch of net, and god knows what else. One could scarcely see the man. Ed Mitchell, too, came back with many mementos to keep him busy labeling. Ed is very systematic and collects everything—eyeballs of fish, anybody's bones, and so forth. Jim Coe didn't seem to have collected as much, but he is full of joy over the chance to go ashore.

I was pleased to visit the *Jordan* because it helps to have me move back and forth between the ships. The old time-honored tendency of sea voyages involving multiple ships continues to hold true. They tend to form cliques sharply defined by the distance between the vessels. It is quite difficult to have enough communication by radio to assuage this much, but a few beers aboard, a little time gassing with the cook, telling stories, revving up about the successes of the day, makes all the difference.

There's some fine folks on the *Jordan*, a considerable bit more seasickness than here (she rolls about 100% more) and the crew, in part, is unionized in attitude, while here it is a group who works any hours needed, any time of the night. Men of the *Jordan* crew, however, have been very helpful, but some, like my old friend Mac, just plain won't move unless given 90 minutes warning (to launch a boat, for instance) and deliberately move slowly when we need things to happen fast. I almost lost my cool during a recent launching while a set was going on, and we needed our observation teams in place. But I held on. It's much better to keep cool and take some percentage of what you want than to blow your top, feel briefly better, and then lose it all.

Frank Aubrey, head of the acoustic subprogram, has been marginally seasick almost the whole trip, I'm told, and he is one focus of this stress, coming up with new ways of doing things that have been already decided, trying to force me into doing things I don't want to do, or can't, and handing down firm edicts about this and that—like no more night meetings because it's unacceptable to make the trip between boats in the dark. So, we are faced with when or how to have necessary meetings. My solution is to take our crew, who are wholly willing to travel at night, across to the *Jordan* after the day's activity is over. We literally have no chance to do it during the day. Joe Thompson was uptight about getting his clean clothes rained on in one such crossing, so, we'll not ask him to do it again, but we'll just get rained on, and my crew, who are a good spirited functioning unit, will make the trek. This does point out a certain smallness of attitude to those on the *Jordan*, but I think this sort of subliminal rebuke might not hurt. At any rate, there isn't much time left anyway, before the *Jordan* goes in. (I've caught the virus in spite of previous inoculation.)

Both Steve Leatherwood and Don Ljungblud are being wonderfully cooperative. Steve saved my life after the dunking by providing me with a shot of cognac, and I'll probably never forget it. Don, who has one leg off at just below the hip, came ashore in the rubber boat, and we had to help him hop ashore across the reef, one of us under each arm. He then assembled himself on the beach, and walked off, his leg a bit soggy but otherwise OK. They've worked like hell, tracking long hours into the night, and next time I'll be on board to help with the watch. Together we've figured out that the OAR radio doesn't work a damn because of the limp antenna that probably doesn't rise up much during surfacing in a moving animal, so we developed a splint and taped it on and get twice the signal strength. Bill Rogers, who has been seasick most of the time, has worked like a Trojan and is clearly one of the most promising young naturalists of my acquaintance. He has worked hours and hours on tags.

So it goes. Our crew here emerges, and many of the personalities aboard come out. Cowboy, one of the speedboat drivers is always in horseplay with the skipper, both Joe and Manuel are capable guys, Joe affable, very casual, Manuel capable and much more taciturn, but good company too, and relaxed with us now that he sees we want to work too. George, the net skiff captain, fully of good cheer, not capable in English, etc. It's comfortable now, and we can joke. Good fisherman people they are. I like them, just as I did my acquaintances in San Pedro. Jim Coe is almost one of the crew, hard-working, capable, liked by the fishermen, and a very thoughtful guy. Good sea company indeed. Bill Perrin continually sees what's needed, and comes up with good ideas. Much of what we have done had come from his suggestions, and from his drive to make things go right. Warren Stuntz, capable, low-key, misses very little of what is going on on the ship, handles the interface between the two of us with considerable finesse, which I know fully requires care. We rather continually cross each other's designated lines of authority, but our communication with each other has been good after a poorer start. He, like me, feels a bit disoriented, probably from the sea motion, and finds it harder to plan here than on shore. Well, enough for the day. I hope the weather breaks so we can get on with the tagging.

October 22, 1976
Clipperton Island

Today I spent aboard, nursing my sore knee and writing notes and getting various things shipshape. Some of the crew went ashore in the helicopter, but most of us languished on board with the wind and rain sheeting by, and the weather offshore foul and unworkable. I put in a plea for people to bring me back some samples of rock from Rocher Clipperton, the 60+ ft. high fin of rock that juts up out of the lagoon edge. Three samples came back, and all are of light gray crystalline rock; not at all what I expected from basement rock in an atoll—i.e. not basaltic lava, but perhaps phosphate rock. I won't know until my brother gets a look at it. (Very interesting continental extrusive volcanic)

I spent quite a bit of time concerned about communications and relations between the two ships today. We are developing a pretty good case of Baird's Oceanographic Disease, which is a disease that occurs on expeditions involving two or more ships with a common or multiple missions in the same time span. Its etiology is rising levels of righteous indignation on both ships, often leading in severe cases to complete

communications breakdown and sometimes rupturing of friendships, permanent clique formation, and other communications pathologies. In the case from which the name is derived the *Baird* and the *Horizon*, two Scripps research vessels were assigned to the East-tropic Expedition and requested to land at Easter Island, where the *Baird* was to pick up a tiki to be planted with ceremony, including mayors and things like that, in the Scripps lawn. Communication had become bad, and the groups potentiated against one another even before Easter was reached. Once there it became obvious that even though Ecuador had given permission there was no way to move a 40-ton tiki aboard, so the *Baird* bought a carved eucalyptus tiki and stored it below. The *Horizon* crew stole ashore at night, cut a log and hid it in their hold, and when they went to sea, assigned a team to carve it. Then they ran their stations at breakneck speed, gradually broke off communication altogether and arrived at San Diego two or three days ahead of the *Baird*, calling in the local officials and having the ceremony. When the *Baird* arrived with their official tiki no one met them. Some of the breaks between even old friends have remained in effect over long periods. There are *Baird* people, and *Horizon* people.

Our case involves a semiautonomous acoustic operation and there are probably confused expectations about who is to be in charge of what. My role is PI for the whole project as requested of me by the Mammal Commission. There was, I know, some jockeying prior to the trip about the role of the acoustic people, and a problem of our behavior effort being without crucial support from them, all near the last minute. I was away until four days before the cruise and came back in a bit of a vacuum about these past events. Even now it isn't wholly clear to me what Aubrey's expectations were, but I find him laying out plans for what we will do and then announcing them firmly to me, while we are laying out our plans here. We try to communicate by radio, and by exchange meetings between ships, but both of these methods have their problems. The exchange meetings take inordinate amounts of time and energy; bad seamanship from *Jordan* crew members makes it slow, and sometimes risky. Schedules of the two ships are different for meals. We can only take people aboard here for meals at noon according to our contract. The *Jordan* sometimes shows two movies at night. The rain gets everyone soaked. The tendency is to do it by radio, but it's no substitute really, since face to face resolution of these complicated schedules is critical. Pronouncements over the radio of plans sound cold, hard, and final, even if delivered with as much finesse as one can muster. One never knows the subtleties of the milieu of the other ship. Here we play a delicate game of winning the respect of tough, hardworking fishermen, many barely literate, and many with severe language barriers. The ship is an independent kingdom designed to go where and when the skipper commands. He isn't used to the complications and delays attendant upon research. But, we're doing well, by constant care, and we're getting our work done. On the *Jordan* it's science against civil service union, where the crew won't do this or that past hours, or without specific notice, and truly some of the crew has been so inured to changing demands and personalities that they treat everyone the same—as ciphers and a part of another world.

The immediacy of the work various people are doing gets lost between vessels. We know vaguely how hard Steve and Don worked in the first tracking, but the chance to show adequate appreciation, or even the need for it are lost. One cannot judge sensitivities across such a water barrier, as one can, face to face. When should a person back off, or change a tactic. Almost impossible to judge without personal contact. Well,

when you have strong personalities these things tend to magnify and righteous indignation arises, egos become enmeshed and it becomes difficult to back away without pain. But, I'll try to talk directly to Frank at the first possible time, to sort some of these things out. I'm confident this will stop the spread of Baird's Disease.

Not much else—a little reading, good notes, some big squid on the deck (jigged off the rail), and we wait for the weather to break.

Some of the problems the fishermen face are beginning to come out. Mostly they circle around a couple of problems. First, they are bitter against foreign competition that does not have to hue to the regulations of the American boats, and many are apparently on the verge of going foreign flag—one figure I heard was 20 boats have applications (to whom?) pending waiting on the outcome of the present rulings, quotas, etc. Already three boats out of Ensenada, and others elsewhere are captained by Americans who “run” the boats for foreign owners. A Madruga was one. They talked of new boats being built for the Mexicans in Norway of large size, but say the Mexicans have trouble filling the quotas they have, and that precautions by these boats re killing porpoises are minimal to absent. Last night we had two Mexican seiners near us, well after dark, with one having its net in the water. Probably just net repairs and not a set. But our folks talk of them landing tuna at San Lucas (where there is also a cannery) and at Ensenada (also a cannery) and trucking tuna across to Van Camp cannery. Tuna landed on the mainland coast is also trucked to American canneries, with no trouble. Apparently money will be put up for boats bought under foreign flag, and no attempt seems to be given to enforcing the terms of the Mammal act restricting such activity by US fishermen. But, if Mexico doesn't catch its quota it is legal for them to fish inside the CYRA line until they do—or in this case, all season because nobody keeps records of the tonnage caught. Our fishermen are very suspicious that it simply means open season inside the line, but not for US fishermen and that the Mexicans will never fish outside the line where it is rough most of the time. I've heard some comments about the violence and toughness of the Mexicans, as related to their low standard of living, and unwillingness therefore to conform to catch limits. They talk of bullets through the pilot house, and recently there was a hanging for a mutiny—two fishermen strung up off the deck house with purse rings around their necks. Others talk of new 2600 tonners with helicopters aboard coming out of Panama (who put up the money?)

The second problem has to do with quotas penalizing the good boats at the expense of the bad. The rule doesn't reward the good fishermen for good performance, but instead throws their kill in with that of boats doing ten times worse.

What to do? What could this trip contribute?

Well, in my view the results of this trip, thus far, amply demonstrate that a good boat skillfully handled, with the Bold Contender system and the fine mesh net (especially the latter) in the backdown area, can have very low kill rates—acceptable if fleetwide, I'd guess. How to get the fleet up to the standards we see here? I think the regs should reward performance, perhaps by establishing two classes of boats based on a year's kill record. Then, allocate a part of the quota to first-class boats only after the initial quota was caught. Soon enough the fishermen would begin to use every stratagem at their command to improve their performance, and I think we would see many new wrinkles developed. Little things that might make the difference but especially motivation, because it would mean dollars.

The foreign problem is much tougher. Enforcement of the MMPA with regard to US nationals fishing on foreign vessels that kill porpoise is a start. Next, is a closure of the transport of tuna across the border (apparently the US buys most of the tuna) until Mexico agrees to porpoise-saving maneuvers.

Next, the international commission mentioned earlier, but not the IATTC alone.

As for science, I think there are some possible departures. I do not think maneuvers to separate tuna and porpoise prior to a set have promise. Luring of tuna to logs could well be useful, especially if the odor hypothesis proves out, as I expect it to do. As for departures in our work here I see some. I do believe that porpoise can be herded inside the net. The method might be sound based, it might be based on something like a hukilau. The porpoises are typically averaging the terror that surrounds them. One can maneuver them quite easily by deploying divers, by net shape, and in general by any means that shifts the disturbance in one direction or another. Tuna are much less apt to escape early in the set since they typically are deep in the net, out of sight. Especially when there is trouble in the set, as for example a roll-up and men are spending an hour or two untangling it, it could well be an important advance to advise a way to chasing the porpoise out prior to backdown. In my view this will have to consist of two things—a way to herd porpoise (which isn't difficult) and a way to repell the tuna from being herded too. That's maybe harder. Could it be based upon the differential between fish and porpoise of fish having extremely acute sense of smell, while porps have none, or on porps having high frequency hearing while fish do not. Could, for example, porpoise be driven with a barrier that also produces bubble trails? Would fish come near it? My guess is no. Then, could the corkline be depressed and the porps let go while the other men fought with the roll-up. Since 80% of the kill comes in these problem sets it could mean a great deal.

Spinner porpoises appear subordinate to the spotters to me. They are peripheral to the spotters, and often deeper in the net, apparently. Their problem is that they seem to spook instead of floating passively in the vertical mode as spotters do. The fine mesh helps a great deal to save them. Bow bunches claim some animals. Maybe some design on them would help. Design to allow the skipper to backdown continuously with the tuna being held off in some way could help, except when the catch is very large and the channel full.

Our data will help count porpoises by helping to estimate what a given number of porpoises on the surface means in terms of those below the surface.

October 23, 1976

A long rough day looking, and waiting for the weather to abate. It did calm a bit in the afternoon, though we skirted squall after squall. The fishermen swear the porpoise schools seek out the rain and hide in it. Nick the navigator, a sharp guy says he's seen it happen a thousand times. We added two times today. Now, why should porpoise seek out rain? I'm less skeptical than I might be because of knowing that in the jack pole tuna boat days the fishermen sometimes sprinkled water on the surface to induce a feeding frenzy—the sounds of bait falling back as they leap. But, in a large squall other things might be at work. Does heavy rain produce enough white noise to mask communications sounds—say of spins, tail slaps, and if so what would be the reason for an animal to seek out such an environment? Are some aspects of sound emission changed in squalls? Do

porpoises jump more, exhibit more high level sound production? Who knows? Does the rain affect the behavior of the prey? Does it somehow make the prey more accessible? Apparently feeding relations are changed at times, because Bill and Ed report mahimahi quitting feeding during squalls (did they quit fishing/).

The light relations surely would change as darkness overhead and the prevention of direct lighting might make prey more (or less?) visible? The adaptation of surface fish to light may be to direct light, in which the silhouette is masked by the lateral bright line of guanine. Does this, under a squall, instead catch light and illumine the fish in a ring of light so that it is easier to catch? Mebbe. I like this last one best, and think it might be observable.

Less likely, it seems to me, is the fisherman's notion that the porpoise have learned to hide from them in the squalls. This perhaps assumes that they can form the second order transform that tells them that the boat is chasing them, not by sound below the surface as they are used to doing, by vision out of the surface, where their capabilities are poor. And they would have to conclude that there were men (or sensors) on the ship that could not see through rain. Or would it simply be conditioning that after repeated experience showed them that the chase ceased? Almost certainly the latter, in my view, if it exists. How is a school directed to squall in the first place? Who says "go" and how does this leadership say "go"? My guess on this is that aggressive individuals, maybe of both sexes, order the school from any position in it, but especially from the sides, and that this tends to form it and direct it. I'd guess that age classes are involved and that in this sense a school may have several "leaders" who may function in a very transitory fashion, since the school itself is such a fluid assemblage. The school can accept new increments on the feeding grounds, and these may pull away at times, spinners may leave spotters, for instance at some times of day or night. And the species school itself may fragment.

Well, on to today's set. We waited all day, with no results, and finally after the time when we felt able to put divers in the water (neither safe nor useful to put them in the dark) a school was spotted running near a big squall, and the speedboats put over the side. These ran in the rain, over the rather sizeable swell, often leaping like porpoises, wholly free of the water as they whined along. The set wasn't a wholly satisfactory one from the standpoint of the fishermen—some porpoises go away, and the final encirclement was a close thing, with the porpoise school skimming along inside the net skiff, not more than a few dozens of yards away. The following then, is the transcript of the set.

1605: Edge of rain squall, speedboats in the water, will be dark before this ones on the deck. Second set today, or rather the second school today that has run into a squall. Nick the navigator says this is very common behavior. About a six-foot sea with some whitecaps from the winds of the squall. We're passing along the edge of the squall.

1628: We're into the circling maneuver with the porpoise jumping in between us and the speedboats, we all move in the typical spiral. Bill Rogers and I have been spending some time peering at what is maybe a pigeon hawk (peregrine) resting above the crow's nest. A beautiful striped breasted bird, with a black mask, and black wattle marks, a fainter cap stripe and a banded tail, maybe 13-14 in. long—a long way at sea.

1629: Apparently some of the porpoises hav escaped between the *Eliz C.J.* and the first speedboat. My friend Fernando is driving one of the boats today—not the culprit I think. There is much impassioned English-Portuguese flying around me making blanked

spots on the tape too crass to record. Porpoises in the school are in a great leaping school, pouring from the water in clean arcing waves. Est. 150 animals, seemingly all spotters, traveling at top speed directly on our beam as we circle around them. Now ceased leaping, now group behind is leaping, now group in front leaps again, pouring in waves out of the water.

1640: Net is in the water (after a false start, and more angry words from the bridge about why it wasn't let go exactly on command).

1641: Animal leaping, broad-jumping through the air, landing on its side. 1/3 side.

Porpoises really quite close to net skiff now. I believe they will catch them but it will be close. All depends upon the lead speedboats shooping them in. They went in the net.

1642: Two-thirds net, skinning in by not more than 40-50 yards. Now clustered as far from the *Eliz CJ* as they can get, against far corkline, perhaps 80 meters from far corkline in a milling school. Leaping has stopped. Two leaps in succession. Over by future backdown channel. Porps in slow mill, approx 100 m from far corkline, towards bow portion of net. Net skiff coming along the bw of the *Eliz CJ*. Bill Perrin estimates 100 animals. All spotters. Tail out behavior now.

1643: Porps up toward bow end of net in a tight mill. Over by backdown corks. Circular school shape. Animals head slapping occasionally. Milling 100 m from corks. Purse cables coming in. Tail out behavior, some nose outs, most animals low in the water.

1645: Very gray afternoon.

1646: Considerable amount of vertical diving and throwing of flukes. Animals almost exactly abeam now. Couldn't get farther from *Eliz CJ* if they tried.

1647: Animals in rather elongate mill now directly abeam, approx 150 m off our beam, 80 m from far corks. Moving slowly, some throwing of the flukes, some diving. Head slap.

161-10: Two high leaps with animal falling back on its side. The school is the most aerial of any we have worked so far. Another lower leap. Animals have moved into central position in net, well away from ship 80 m from net. Another leap, leap, falling on side hard.

1658: Porps aft in net, on our aft quarter, 150 from ship, 70 m from corkline, some aerial behavior, elongate school, moving back and forth oriented parallel to corkline.

1659: Animals in same position as before, quiet mill, a bit closer to far corkline, rings can be seen.

1701: Animals in same position. Occasional aerial behavior. Jim points out we have a current running/sweeping net somewhat aft.

1707: Two backslaps, animals up toward backdown area again. Net is being changed severely by current, pushed back from bow and . . . Some head outs, quite a number of nose outs, some racing over by far corkline as if aggressive encounter was occurring.

1710: Backslap and aggressive encounter. Another backslap, backslap.

1711: Aggressive encounter, animal thrashed and threw its tail out of the water. Flurry underwater. Rings piling up clattering and clicking. School conc. more toward

stern now in large lobe of net, still in biggest open area 70 m from far corks. Quite a lot of diving and throwing of tails out of the water. Some formations evident, milling.

1714: Head slap, aggression may be around edges more than in center.

1715: Very strong aggressive encounters and a leaping out of a fair proportion of the school in center of the net. Relatively tight mill. Purse lines still coming in.

1717: Animals abeam 30 m from net and 80 m from us. Much throwing of the flukes as animals go down in high angle dives. Relatively tight mill.

1737: Animals quietly at surface, nose outs, vertical divings. Whole school has turned and is all facing toward the stern, toward the far corkline and they now begin to come back again.

1720: Thrashing against far corkline. Animals toward stern 20 m from corkline. Moves back toward bow, at edge of backdown area. One group makes this move while others lag behind.

1722: Two very clear groups, one in backdown area and one at mid net. Head slaps on periphery of school.

1723: Rafting near surface, brown of bodies evident through surface. Head slapping at periphery. Circular mill. Air amount of fluke throwing. Net over power block.

1725: Net over power block and agitation noted in school. Reacted by more rapid swimming, and by breaking water subsided to nose outs, moving quietly.

1726: Net coming fast. Sound skiff off bow.

1732: Moving quietly, some throwing of flukes and near vertical dives occur. Animals at backdown area. One group right at backdown corks. Porps in a fairly long school along far corkline. Prob. 80 m long.

1739: Net coming with backdown buoy 200 ft. out. Light is fading. Unusual amount of oil surface.

1741: Aggressive encounter at head of school. One animal appeared to slap another at edge of school. School spooked. Speedboat at corkline 80 m away with engine running. Circles to backdown channel. Animals all turn and move toward us away from speedboat.

1742: Net about half the length of the ship. Animals markedly closer to us as net closes down. Speedboat tied up at tip of backdown. Backdown cork aboard.

1743: Porps sliding back toward end of backdown area.

1744: Another ponga moving into position. Obvious increase in speed of diving and the amount of white water as boat pulls near. Also, they moved over against the far cork line in obvious response to arrival of boat 20-30 m away. Tight bunching of school now, as we move toward backdown. Four red corks in air.

1745: Net narrows, 1/3 length of ship.

1747: Move into backdown maneuver. Animals moving very quickly now and diving nearly vertically. Most below water. First class backdown. A fair number of desultory tail slaps as channel develops.

1750: Fairly dark now, tight tight bunches at end of backdown area, a little low leaps. Backdown in full flood, corks submerged, some taking off directly toward Steve Leatherwood in the skiff. Hope he was recording.

1802: Backdown completed. Some fish in the net (5 tons)

October 24, 1976

A frustrating day—no set. One school was seen this morning but it had very few fish and the ship went on by. In retrospect I wish we had set on it, fish or no. But we didn't. In the afternoon there was a very small school (less than 100 animals) which I at first wanted to set on, and then my people talked me out of it. No fish was bad for relations with the *Eliz. C.J.* crew, and resets on the same fishless school wouldn't help much. I assented and called it all off. No further chances arose. Frustrating. A good poker game helped and the Sunday pro ball games, and a betting pool enlivened the day. Back to our respective ships. I worked a tiny bit on the book outline. At night we traveled, we hope to better grounds.

October 25, 1976

Made a tagging set today, but the Gods conspire, and continue to conspire. We spotted a school today about noon, with the *Jordan* some 20 miles to our stern (2 hrs. or more away, and we are moving in chase, which makes it more like 4). It was a group of 20-300 porpoises, all spotters. The problem was to keep Manny Jorge in check while the *Jordan* got near enough to put its men in the net area. We had issued requests to keep the *Jordan* closer but the fisherman spirit is such that it's like trying to tame a wild horse to keep them in check, when it might mean slowing fishing. Predators indeed! One ploy as to put me up in the chopper to look at the tuna-porpoise bond. Here are my taped notes:

Took off from wheel house, swooped low over water and climbed to about 1,000 ft. Over school, est. 250 animals. Big rain squall maybe 10 miles away. The animals moving almost due south at the moment. Many leaping from the water. That direction will take them away from the rain squall. The school may be reacting to us. A smaller group (20 animals or so) ahead of main group, that may be spinner porpoise. Separated from main group by 150 m. approx. Can see shining fish bellies deep in water off to both sides of the school. 75-100 m away from main advancing front. School now composed of a main discoidal mass, with a smaller group off to the left, all moving very swiftly, leaping from water. White reentry marks.

1321: School shaped like a check mark with point going forward. Long left 200 m long. Animals underwater back in bite of checkmark. May be fish, shining.

1322: School shape changes to elongate oval, moving in direction. . . I no longer see any animals in lead. School a broad front. Leaping as they travel. Waves of animals coming out most of the time. Occasional times when school disappears. Dove. I can see fish moving along behind the school, and can see what may be fish out in advance of the school. 200 yards out beyond both wings of school I see fish. I see fish directly under the porpoise school, a few actually leading it. Deeper than the porpoise and shining to either side.

1330: Moving in on school again for another look at the fish-porpoise disposition. Porpoises moving in a fairly circular mass now somewhat broader than long. Leaping as they move along, in considerable number. School now quite oval shaped. School now elongating traveling along as a front. A lot of fish aft of the school traveling in the wake of it, down deeper. I think I see some fish out on the wings of the school. Shiners (fish) in advance of the school, but the main mass however is below and behind the porpoise. Fish clear out on the wings of the school on right hand side, deep down, and some in advance

on that same wing. Probably 75 m ahead of the school. It's not as though they were all below and behind, as advertised.

Animals now strung out in a long line, diving as they move forward. Some of the fish are well behind, probably the majority of them. There are very few birds, 3-4. The great mass of fish is now directly below the main part of the school. I can see porpoise below the water, about to come up.

Shiners again, below and behind the school. School now virtually circular with one little satellite group out behind 100-200 meters. I'm sure they will close together again.

1339: Back to *Elizabeth CJ*. Many flatbottom cumulus around, very few patches of blue sky.

1425: Lying to waiting for *Jordan*, she's 12 miles away out of sight. Porps are off port bow, a bit spooked by helicopter. We'll stay a little way away to keep the spook index down. I'm going to go out in net skiff in this set. My friend Big George will skipper.

1515: Speedboats in water, circling, some 15-20 animals escaped, running like hell.

1517: Porps in long line, some way way ahead, and some back in boat bend. Helicopter may have tired them.

1520: Not too long, I suspect before we get the word to be cast off. I'm sitting up in the prow of the net skiff piled up on top of this huge 10 ft. stack of net at about a 35 degree angle with our stern in the water waiting for the word to knock the pelican hook loose and to have the skiff launched. The skiff is huge—maybe 20 ft. beam, 35 ft. long, with a big powerful diesel and a well guarded propellor. Porps on beam seem to be moving relatively slowly. Long ways out.

1522: Expanded our circle a bit.

1538: More animals to be seen. Well within reach of skiff.

1540: More bunched, moving along in leaps. Amazing how much running they can take. They were chased by helicopters for an hour or more before this set. Skiffs have opened up again. Presumably.

1542: *Jordan* closer astern—8 miles away. No porpoise in sight. People on mast do. Circle pretty open. Twice normal net width. There, abeam of us, and low in the water I see school. Helicopter off. Tagging set 6. Second skiff is missing. The speedboats race at absolutely flank speed, sometimes leaping free of water. I see all four skiffs now. Circle has widened again and animals are way off.

1546: It's something to watch Joe feint with speedboats, opening and closing circle as animals do not behave themselves. Considerable part of school is fairly close in towards us. Leaping from water as they swim along. Helicopter serving as a speedboat, and it seems to be working. Low over water 6-10 ft.

1557: A little closer. Porps continue to leap.

1558: Much closer, drops of rain occasionally, some tried to escape at bow and were herded back in. Porps refuse to be bunched.

1604: Porps abaft the beam now moving more slowly. Deck speakers have come on. Porps have slowed.

1608: Leaping and running as fast as they can and turning away from boat, looks like a speedboat out of operation. No jumps.

1611: Tight turn, porps go away from *Eliz CJ*. Hard to corral. Turned back toward boat, running for speedboats to replace downed speedboat.

1616: Swimming very low on water now. Will be ours if we can hold out. About right diameter. Matias bends over pelican hook.

1617: He hits it and we're off. Cascading down net pile, with net leaping off stern. *CJ* looks huge.

1620: Third net, porps in middle of net.

1621: Half net. Engine on skiff on, beginning to tow. Skiff noise helps keep porps from running through. I get picked up by a speedboat and taken to tagging skiff at backdown area. Four radios are placed, and about 60 tags. We begin to track the radios but they are lost almost immediately. The porpoises are lost within less than two miles, we guess. The crewmembers of the *Jordan* follow them briefly on the ADF at first getting bunches of signals that gradually become more sporadic. By the time Frank Aubrey gets to the bridge they are gone altogether. Warren Stuntz and I went aboard to help track and were able to follow one individual that had been equipped with a small 1-second xenon flasher in addition to the radio. This unit gave out a very intense light frequently enough that we were able to follow the group for some hours, losing them on the midwatch. Always, the animals were at the edge of our vision, and when we turned toward them or put them on our bow they evaded us, and finally they were lost altogether. Even though we were within about 2 miles est. at times there was no radio indication. The radio was dead. My guess is that with the transmission range of these radios we have no hope. The animals probably spook from the sound of a ship four miles or more away and within two miles they are in full flight and one can very seldom get that close. Without more signal strength we really have no hope of radiotagging results.

October 26, 1976

I was up at dawn to see if I could help in case we were still on the animals, but we were not, so I went back to the *Elizabeth C.J.*

Having two ships, of different speeds is a very difficult problem, and having one that launches boats in seconds, and one that dawdles for $\frac{3}{4}$ of an hour at times to get three skiffs in the water is only to make it worse. Two ship programs of this sort are a thoroughgoing menace. And the gods (there *must* be more than one) of things mechanical have it in for us, for sure.

We launch into tagging recapture set No. 7. But first, some other details. As mentioned before, we lost the tagged animals due to faulty radios, and our searching for the school proved fruitless until we received a call from the *Sandra C*, a seiner under charter from the Tuna Commission. They had made a set and caught some of our tagged animals, including some with radios (two) along with 70 tons of tuna, and considering that several of our tagged animals were in her net that amount either accumulated overnight or two schools merged along with aggregated tuna from one or the other source. At first they didn't want to give up the radios but we finally prevailed and went over and collected two of ours. One, the skipper said had virtually exploded when opened, and the battery case was full of salt water. This was an old style stiff antenna model, and I noticed that the O-ring was missing. Was it missing when the animal was launched, or did the Captain of the *Sandra C* lose it when it was opened? No way of knowing. The other had a broken antenna, probably when the stiffener we put in was

wrenched loose. So, our improvement didn't work, but without it the range was useless, so we are trapped.

Knowing where this school was we asked Manny to make a set on it, and he responded with grumbles and went the other way, talking about the goddam charter and how we wouldn't have gotten himself into the affair if he had known how slow the *Jordan* was, or how much it would interfere with his fishing. He forgets that it's only due to a legal fluke that he isn't the only US boat allowed to fish inside the line. At any rate I went up to see what I could do with him, and pointed out that the sooner he got our tagging stuff out of the way, the sooner we would get out of his hair, that we didn't want to foul up his fishing either, etc, and then I left it to him to choose, and he chose to chase the tagged school. When we got to it, it had grown greatly and contained a subschool of some dozens of eastern spinners. The school was variously estimated at over 1000 animals, down to about 600 animals, but nonetheless at least 4-5x the size of the school from which we tagged animals. I was interested to see that spinners had joined and that the schools were so labile—just as I had expected.

We made a good set on them, and when it was all in found that about 70 tons of yellowfin had been taken—a fine set, and one that went a long way toward stilling the grumbling of the *Elizabeth CJ* crew. But, it was not without serious problems for us.

While at the corkline of the backdown area the animals piled up against us in phalanges, and began spilling over the corkline. It wasn't depressed very much most of the time and even so they pressed up against it, mostly floating into it, back first, turning and then flipping up and over the corkline, accelerating at once and disappearing. Many came up head-first, faced toward the line, and easily flipped up and over the line to freedom. The impression, and a clear one, was that they knew what it meant to be in a backdown channel and they knew that they could help themselves in getting over it. In short they are being trained, and apparently are by no means as vulnerable as the porpoise that are not so experienced outside the line. They don't panic even though crowded together, with few exceptions. I noted one spinner ram the net, and thrash, but the 1 1/3 in. mesh didn't catch him and he backed off easily, and then escaped. We noted the porpoises flooding out, and leaving us nothing inside. We gestured to stop, and I had previously talked with Manny to attempt to outline our needs to him—150-200 animals in the set, a net opened again to a size that would let behavior typical of a net go on, and a chance to tag. Tag we did. Dave Holts darted them home, Bill Perrin called them out, and I recorded as before. We put out about two dozen tags. All of these eventually went over the cork line as we were unable to stop the backdown and let the corks up. They just didn't come up, and all our hauling, gesticulating, etc., didn't do it.

Finally, with 4-5 animals still left I called it all off and retreated. The corkline just wouldn't come up, damnit. Later, we learned that it was because there were 70 tons of tuna in the net below us. No hope. They brailed and brailed, the big fish cascading out of the braile net into the channel way, bumping and thumping and smacking into the well combings and thence down into the supercooled brine below, where they would be rock hard in a few minutes. Joe Thompson photographed in the midst of this melee and then descended outside the net (a thing I'd never do, as that is where the sharks patrol back and forth) and he was met by an oceanic whitetip, which he pushed off with his camera and then scrambled, eyes wide open, into the Avon raft. No place to be. During brailing,

for example, the skiff is surrounded with sharks nipping at the net, taking out pieces and big hunks of tuna that are pressed against the webbing.

Well, we try again. I think another try at tagging is in order, and if the catch is less we may succeed.

In the evening Bill Perrin and I went to the *Jordan* for a long meeting that cleared up many things that needed clearing. Tomorrow we will be ready for either a standard set or a tagging set. The weather's improving.

Well, we'll test the hukilau soon, but before that we'll do another tagging inside the net, and then a standard set with a single porpoise in the net at the end for recording reasons. My guess is that a single animal will prove to be [?], but if he does, perchance, sound off, they expect to get some interesting data from him.

October 27, 1976

We've been trying to figure out how I could go back on the *Jordan* to Manzanillo and thence home. I'm anxious to save the time, and I think that Warren Stuntz could easily handle the work here, in terms of leadership. In fact, we have too many chiefs. Warren and I get along very well, but I'm sure it would be easier if he had a clear channel of duties. Besides, I have to go to HongKong and want to get back before Christmas, and then I've developed a pretty good case of heat rash of one arm that won't go away. But, I apparently left my passport at home in anticipation of landing in San Diego. Well, maybe I can go in as a medical case, or something like that. I'll call home tonight and see how things are going, and see if Phylly can locate the passport. Well, it keeps things exciting.

Set 8 (Tagging and Obs. Set. Perrin Maneuver)

0941: Clear calm day, 5-6 ft. swell running, scattered clouds. Beginning circling maneuver, speedboats in water, no wind. *David Starr Jordan* very close behind, will be able to get into position easily. Animals moving very swiftly, diving from the water in cascading jumps, as is typical of spotters when traveling rapidly. Estimated at 250 animals, but I think it's more like 100 animals. Is going to be a relatively short set as animals are behaving themselves nicely and turning in a group toward the boat.

0947: Not running very hard, hanging in tight group off port bow at 60 degrees at movement. We will get the wind on the port beam and then make our set so the vessel is forced out of the net, a force counter to that generated by rolling in the net.

1948: Nets in the water.

0948: 1/3 net. Don't see porps at moment, abeam, milling, almost as if they anticipate being caught and said, "Oh hell, we have to go through this again." There's one record of a *Delphinus* school being set on 5x in one day, so one can get the idea.

0950: Half net, porps well inside set. Heading toward aft corkline, two groups, one of which might be spinners. Thrashing near backdown corks. Circle a complete one, without a portion that needs to be taken up.

0955: Picking up purse line, perfect set. I will leave the recording now to go into the tagging skiff for tag placement, and Manny will hold the net open for us. We will then observe the animals underwater.

Bill Perrin and I were picked up by the whaler and taken over to our position along the corkline at the edge of the backdown channel. My task this time, was to jab in the dart tags, a specially pleasant task as it can't be too comfortable for a porpoise. Also,

Bill had bruised his ribs on his stint the day before and was having trouble sleeping and just couldn't do a repeat. So, I positioned a life jacket in the bow and was able to lean way out and maneuver around like a cobra waving its head. When backdown came I was able to reach and jab most of the animals for which we had tags until Joe Thompson came up under me and forced the animals all over against the backdown corks. It didn't matter, though I bleated in pain, because we passed the tags to Jim Coe and he was able to place the last two. Then, while Manny and his boys opened the net to a pond about 100-150 ft. wide and 250 feet long, and I'd guess 70-80 ft. deep, Bill Perrin and I worked our way into the net, in the Avon with the regular diving team. The sun was bright and the water crystal blue. I could see the fine mesh panels dropping deep into the water, finally to be replaced by larger mesh on the very bottom of the channel.

I followed a single animal for a considerable length of time, able to follow it because it had a four-color tag—yellow, blue, white, red. It acted more or less independently of groups much of the time, though on at least three occasions it joined them. It dove in a rhythm—several short submergences only a few inches to 3-4 ft. below the surface, followed by a long dive, then some short submergences, and then a long dive. The series went like this: 3, 3, 5, 6 seconds dives interspersed with breaths, and then dove down deep into the net, joining a couple of different groups enroute, staying below 158 seconds, then he came to the surface again in a near vertical ascension, and took three breaths at the surface of 3, 3, 6 seconds intervals, and then submerged again for 120 seconds. The animals seemed to have no reaction to swimmers in backdown area at all. He swam right by the divers to join a subgroup swimming at 35 ft. or so down, horizontally.

Then I watched a mother-young pair. The young had been swimming individually. It was quite small, plain colored, with protruding eyes, and it repeatedly dove deep in the net, as if searching for a parent, and then joined up with a spotter phase spotter[?]. I could see no particular agitation when they met, nor could I see any evidence that the adult attempted to chase the young one away. They just accepted one another in the adult-baby roles. Normal mother-young positions were [?] including assisted locomotion. They went into a pattern in which they would take one or two breaths at the surface after 1-2 second dives, and then dive for about 50 seconds. The dives that I counted were 47, 58, 65 seconds.

As to structure in the groups in the net, I saw many animals hovering at the surface, some swimming horizontally taking breaths at intervals, and others floating with the top of the head, and often the beak out of the water and the tail bending down steeply in the water—quiescent, or nearly so. Then there was continual interchange with this group from below, mostly in the form of steep ascensions or dives, and [?] a levelling out zone at 30-40 ft. down where subgroups swam off together in the rather typical porpoise groupings, 2-7-8, spaced within inches of each other, staggered with relation to which animal had its snout tip furthest forward. The backdown channel is just that, a channel, with webbing a curtain on the sides, sloping deeper down, with a flat bottom. I could not always see the bottom by snorkeling at the surface. It rose very steeply to the backdown corks, especially since we had supported them with extra buoys to make sure our animals didn't escape. I saw rather few folds. I saw a dead adult, lying on the webbing deep down, its belly shining. Bill saw two dead juveniles (calves). I noticed quite a bit of

parasitism in animals in the set. I noticed *Xenobalanus* from the tips of both pectoral flippers [?] the little lost baby, and noted *Conchoderma* from the gums of one adult.

Then, it wasn't too long after we came on board again that the lookouts (peering through high-powered binoculars mounted in bungee chord slings and swivel mounts in each side of the bridge) told that there were porpoise ahead. In fact the water around here is full of life—yesterday *Grampus*, *Tursiops*, some pilot whales, today streaker porpoise, pilot whales, and then a helluva big school of porpoise, with pilot whales around it, birds and a lot of fish. The helicopter is a wonderful addition. They can check out each school to see how much fish, and as like as not locate the fish from the air by watching for birds or running porpoises.

At any rate, it wasn't too long before they were on the next set, which we designated as Set 4 (reconstituted) and in which we were to have a behavior team in the water, the photographers in the water, me on deck checking differential behavior, Ed up the mast, doing aerial behavior, and various other people doing other duties. Warre went up in the helicopter after the net was set, and buzzed around looking at porpoises and fish. He saw 'em. There were on the order to 750 porpoises (spotters and spinners) and 65 tons of tuna, and at least five oceanic white tip sharks.

The following is a log, prior to my taking up my station for differential behavior.

Acoustics team will place a sonabuoy in the net.

1437: Pursuing a school of a lotta porpoises, supposed to be 1000 or more, and quite a number of pilot whales. Supposedly a lot of fish. The day continues to be beautifully clear, and 4-5 ft. swell, essentially no wind, puffy clouds. In the last set there was a white-tipped shark in the net, that apparently bit a hole in the net and escaped since it didn't come aboard. Obs. team came out of the water and in all of my observation swimming I never saw it. One of the dead porpoises in the last set had a huge mouthful of flesh taken out of the anal region including the posterior intestines by this fish.

Five speedboats in the water because of the size of the school.

1439: Going out in a line in advance of the vessel, speedboats curving out to the port a bit. The helicopter buzzes over it all like a little dragonfly, probably twice as far out as the speedboats . . . couple miles away, over the top of that school.

1504: Coming around in a very broad circle. Huge school of porpoises off the port bow traveling very rapidly, of three major groups, stretching over a number of hundred yards of sea. There are always some animals in the air. The animals are strung all the way from the 3rd speedboat to beyond the stern of the *CJ*, across a long stretch of . . .

1512: A number of booby birds over the school, beyond the front ponga boat.

1531: We're still circling. The animals are getting closer in. Some apparently are attempting to escape from the rear line of ponga boats judging from the fruity Portuguese being bandied about over the airwaves. I wouldn't be a bit surprised but that we might make a set next time around. We have to get the wind on our beam the next time.

There goes the net. Nets piling off the stern. Porpoise were hard for me to see foreward of the beam. ¼ net. Speedboats race along and throw up great cascades of spray, particularly because one of their favorite maneuvers is to circle. This closes up a gap. They'll swing out in a great circle, throwing spray in all directions. The animals are moving toward the corkline as planned. Still some birds over the school. So far only

spotted porpoise in the school. *David Starr Jordan* is closing on net. Porpoise school is collected over by the far corkline, and it is:

1542: Over to behavior log. I will be filling out differential behavior log looking for patterns between spinners and spotters.

In a nutshell, what I saw, and logged, as a fairly sizeable group of spinners (maybe 100) that sometimes broke in two pieces, but mostly stayed on the margins of the spotter school, especially inside toward the *Eliz. C.J.* and which once went between one of the Avon rafts and the corkline toward the stern of the *CJ*, where net was coming up, a thing I rather doubt that spotters will ever do. At that time the spinners were separated by perhaps 50 yards of open water from the main group. Spinners dive and stay below longer than spotters, and from our underwater observations, may dive below them, level out and move very deep in the net. They seem much less equipped with protective behavior than the spotters. The schools were very much influenced by the skiffs and gear in the water, and once . . .

October 28, 1976

Today, we will do standard set No. 5, which is a rather straightforward observational set, with divers, acousticians and photographers in the water. I will be on the Crosstrees with Bill Perrin and Ed Mitchell doing observations, mine of diving rhythms, if I'm so lucky. It's another clear day, with clouds scattered about on the horizon, but sunny here. No wind, and it seems to me, getting a bit hotter and muggier.

0956: In the mill, already, *Jordan* off our bow. 4-5 ft. swell.

1006: Half net, porposies are well into the net. Modest school of about 200 animals.

1010: About 100 yards astern of us open. Bill says there is quite a group of spinners, and I could not see them for a long time. Bill said they were down.

1019: A 45-second dive by spinners.

1022: 59-second dive. All these records are for the small group of spinners. It is impossible to measure rhythms in the spotters as there are too many indistinguishable groups, but the spinners stay nicely together, surfacing within seconds of each other.

After this session, which netted about 10 tons of fish (seen only very late in set by me) we went to the *Jordan* for a meeting about what had been found, and about future plans. I found my passport and will be able to get home when the *Jordan* goes in. That will be a great deal of pleasure for me. Not that this boat and the work hasn't been an experience amidst good folks, fishermen and colleagues alike, but I'm so jammed up with calls on my time at home that the extra two-three weeks will be bliss, and I'll be able to do the Hong Kong trip in time for Christmas, thank goodness. Back to *Eliz CJ* at dusk, a Streisand movie and notes.

October 29, 1976

We are cruising through calm waters and under gray skies looking, as usual, for birds and porpoises. Once they're found (by the big glasses on the bow) the helicopter goes up to check out the school for fish. This time Frank Aubrey will go up to drop a sonabuooy in front of an advancing school, prior to our making a set. I'll be in the mast with a 250-magazine motor-drive camera taking pictures of the set.

It's firm now. I'll go home when the *Jordan* goes in. It will be good to see the family again, and to see how everyone is doing.

I spent part of the morning talking to Sandy Romero, the chief engineer who was telling stories about jackpole fishing and various stories about the accidents at sea he has been part of—some terrifying tales. Once he was caught in the engine room when a generator was burning under the only escape ladder. He lived because he fell, full of smoke, into the shaft alley and washed back and forth. He lost all his hair, and the entire engine burned up, burning the deck out, and he thought the Devil had come for him when he saw these big-eyed monsters coming through the smoke—the Coast Guard with gas masks. That was the *American Boy*. Another was north of Cedros on a purse seiner, in a terrible storm and he and the skipper were discussing whether they could turn back for Cedros and shelter, the skipper said “no, they'd capsize” when they felt a great swell drop the ship and then felt her heel over so far that water went in the pilot house, and made the wall the deck. Sandy grabbed a torch and cut the purse cable. The net was overboard, and the net skiff down in the water somewhere. Once relieved of that burden she righted herself, and ultimately they were able to make port on their own steam.

He also spoke of jackpole fishing off places like Cabo Corrientes, and Punta Tosco, Baja. He said the mast lookout would call down what the school was—spinners or spotters, or whitebellies—and that would determine whether they would take 1-pole rigs out, 2-pole, or 3. The spinners carried small fish; skipjack and small yellowfin, the whiteels in the Gulf (*Delphinus*) mixed fish, and the spotters, the larger fish. He said that when they found red swimming crabs, they knew there would be fish and porpoise. Once he had taken 120 tons of fish from around two whales south of Punta Tosco. He mentioned that the spinner schools were larger then, and that the fishermen knew right where to find them. This was all coastal fishing, because they had to make bait inshore and then get to the fishing grounds. No one knew, he said, that there were porpoise and tuna offshore.

Standard set No. 11. The attempt on this set will be to mark the dorsal fin with a paint for measurement of dive rhythms. We had to scratch the drop of a sonaboy ahead in the uncaught school because this particular school was very wild and even the helicopter far overhead split them. The acoustics crew was not ready to do the test in which they catch a single animal, let the rest go, reintroduce and record the single animal, and then let it go. So, an attempt at tagging, which involves capture, is it. I have little faith in their chance to catch an animal prior to backdown from a skiff or an Avon.

Anyway, Bill Perrin, Ed Mitchell, Jim Coe and I went up the mast.

1256: speedboats in water deployed out ahead of the vessel. Warren tells me that one aspect of the chase is that because the boat is going in a broad spiral, when the porpoises come to the wake, they turn, and because the wake fades with distance aft, it is less effective in front of the vessel, hence the placement of the speedboats (or at least one reason for them being placed there). Thus the spiral wake acts as a trap for the advancing animals. I thought some of the advance animals have escaped over or under the wake. The helicopter is presently bolstering this effect of the wake by hovering over it, just in advance of the firstboat (Luis) Warren says the speed boats follow the wake to some extent as they go around, if the behavior of the porpoises allows. The relationship between netsize and catch is interesting, too. It is obvious here.

1408: Animals just now being trapped well enough for a set.

A smaller net would require a longer chase, to be squeezed down tighter, and as the animals get wilder and wilder the importance of the large net becomes greater and greater. Even now, this boat fishes with the net seldom closed at the end of a set, but extended on the cables a hundred yards or more, and guarded by speedboats while it is closed. Even so, sometimes it's a close thing. This vessel can take chances a little vessel couldn't, and can reach out for more animals. Thus the 200-ton boats fills itself about as fast as the 1700-ton boat.

Porpoises right in this side of the wake, turned along it and leaping along this side of it. Turning in toward the center.

1408: Net let go. Another aspect is the length of chase. Some of these sets use every bit of gas in the speedboats, and some even drop boats along the way, out of gas, and thus the time allotted to corner or corral the animals is regulated.

The porpoises react to the net by what seems to me to be a sort of "Oh Hell, here we are again" phase, in which the animals slow, and begin to mll—probably they detect the net ahead, but maybe they also say "Oh hell. Wait till the beggars back us out, and let's hope they do a good job."

The school looks half spinners, their big sail-like fins showing clearly. Unable to record meaningful dive sequences because there may be 200 spinners in the school and they come up in various parts of the school and not in coordination. The subgroups that do come up are from about 10 animals up to 30 or so, seems to me, which is about how many we had all told yesterday.

1423: One thinks this means is that there isn't cohesion in diving groups of large masses of spinners. Spinners at both ends of the school and in the middle. I've seen them on all sides too, now. There does still seem a tendency for them to occupy the edges though there are so many animals the effect is swamped here.

1446: Steve trying to catch an animal, ultimately fails, using hoop net. Saw spinner with oval white mark at base of dorsal on left side (3 in. long, 1½ in. high) traveling with a spinner with a tattered dorsal—a narrow notch cutting diagonally into the tip of the fin. [Drawing of two spotters with truncated dorsals.]

One of yesterday's tags seen on an adult spotter. We can tell it was yesterday's tag because of the orange reinforced waterproof streamer at its base. It's on the right side, part way down the side anterior to the dorsal fin. Try as we did we couldn't identify anything further about it.

Divers are in the water. Second bow bunches in. Rolling net.

1502: In spite of the fact that I had looked at the school with glasses since the first part of the set this was the first time I saw that single tagged animal. I guessed 600 animals, but Bill Perrin feels it may be a little over half that. Oh imprecision, imprecision, in telling school numbers.

1513: Lots of what seems to be aggressive behavior in spotters, especially. Tail slapping, white water all around, lots of thrashing. Saw adult with two young, one on each side, lots of thrashing. Explosive breaths noticed again, as backdown approached and as animals become crowded. One can see little puffs of vapor, and one can hear the exhalations. Particularly evident in spotters.

1515: Chopped off dorsal in spotter noted. Much thrashing in spotters, again, Bill Perrin jumps in with Jim Coes raft to try to recover info on tagged spinner.

1519: I leave to photograph backdown.

Later I learn that this was three near-catastrophes day. First, when Bill Perin took his raft around to the opposite side of the *Elizabeth C.J.* to be joisted up, they didn't give him time to unsnap his tow before they brought the speedboat that was towing him aboard. Up he went too—and fell back in the water, losing a diving slate and one swim fin—fortunately he is OK. Then, young Joe Thompson, I learn, lingered in the backdown channel and became tangled with some line around his dive unit, and was thrashing about with Joe, Sr. helping him. Bill Perrin pitched in and got him out. He was frightened, I'm told, and well he should be. No one else in backdown channels. Then, finally, the helicopter radioed back that it was on zero gas, trying to track the rest of the school. They came in on the 8 gallons phantom reserve that Bob the pilot has arranged. They made it, but we had already dropped the big net skiff and run to the rescue. Enough for one night.

I'm full of lethargy. The old sea malady that strikes when one doesn't have enough physical work to do. Well, it won't be too long until I can stretch my legs in Manzanillo. But until then I shall feel less than fit most of the time, I fear.

And the catch!! I thought there wasn't much until I saw the backdown channel peaked with white back of the porpoises, where the fish were breaking water. As the net came in further the whole channel was filled with breaking fish—lovely amber and blue beauties, up to maybe 150 lbs., and then the net was sacked up alongside the net skiff, and big bulges of fish were crowded into the folds of the net. Finally the skiff and the men aboard the *Eliz CJ* got the sack in place (corks up) and began to braile. Before they were done they and between 55-60 tons on board. A good day's work. But Manny was still out in the chopper hoping to set on the remainder of the school, but darkness got him first, so he will have to wait for tomorrow. Not a porpoise was lost. More and more it is evident that the present system, wisely used throughout the fleet, will push the kill more and more into the foreign boats, and that the real problem now is 1) to educate and insist on performance from our own people, and 2) to do something about the foreign kill.

October 30, 1976

A fishing set made today (Fishing set 15) in which a group of spotters, which had been travelling with a streaker school, which escaped, was caught along with about 10 tons of tuna. Bill Perrin reported that a single tagged animal was in the set, but no one could identify the tag.

Joe Thompson recorded yesterday's tagged animal on film, so it might be identifiable. The film needs to be checked. I merely watched the [?]
—the weather was rougher—big swells and the Jordan was 15½ miles away at capture.

October 31, 1976

Set No. 11. The acousticians will capture a single animal and after the others have been backed out, replace it in the net and record from it.

The day is partly cloudy, some squalls, but mostly cumulus and there is a pretty large swell running—6 ft., perhaps, no wind. Joe Thompson will go up in the chopper for photographs of the school before the set, and during the set, and then again over the backdown operation.

9:38: Joe Thompson has just left to photograph. A flight of cattle egrets over the stern (4) floating along in their effortless flight. Porpoises are off the bow, and I see one

bird. Guys on the speedboat deck listening raptly to a soccer game from Lisbon. Portuguese boat—good people, lotta skill, lotta noise, lotta drive, lotta pride. Speedboats in water at 1032. Rough ride for operators.

1043: Boats circling tightly as is *CJ*. Set pretty soon. Animals in good position moving relatively slowly.

1044: Helicopter takes off. Near Chirique today—a big seiner with a helicopter aboard. What are they doing here? Luis up in the lead boat is leaping out of the water as he hits these swells, spending a fair part of his time in the air or close to it. Luis runs well inside the ship's wake now, leading us into the spiral. The porps are very cooperative, just off our beam. Fairly simply set.

1047: Net skiff in water, animals not breaking water at all. A few little flecks when they surface, small group.

1048: 1/3 net. Half net. Animals well inside, very quiet, 100 m from net skiff. Almost a perfect set, that is the circle will be complete without needing to haul in the cork and purse lines very much.

1051: Set complete. In going up the mast now. This open elevator going up a slightly raked mast past frames that slide by inches away is a dangerous affair. It would be easy to fall into the frames and be sliced by the rising elevator. We switch to Perrin's tape recorder which will do the recording in real time. I will monitor aerial behavior on set 11, in cross correlation with Mitchell. I estimate 75 animals.

School is now up and 80 yards from corkline on our beam. Quiet spotter school. Cannot find entire school, no aerial behavior that I can detect. Animals occasionally throwing flukes, desultory headslap. Animals throwing flukes but diving quietly. Most are not. Simply submerging quietly, school moving toward bow of ship in quiet fashion. There goes tails out as animals dive.

1103: Helicopter over school, flying directly over net. Animals mostly submerged. Two tail slaps as animal is directly overhead. Some throwing of the flukes. Now animals are propwash of helo, and as this happened there was diving of the animals. Two animals came up and did nose out, waving nose in air. Another dive and throwing of flukes as helo goes directly overhead. Animals all below with helo overhead.

1104: All below. One comes up, others come up as helo circles away, but returned, diving, animals throwing flukes as they go down. Animal rolling on side throwing pectoral out of water. Fernando in water in net below (minor rollup). Helo right over school, very low down. Animals throwing flukes in some numbers and diving as helo is directly over the top of the not more than 15 ft. above the water, catching them in a very strong downdraft. Animals are below, thrashing tail slap. Unsolicited behavior on part of helicopter. Animals back at surface. Helo returns over them. Animals taking this remarkably calmly. Some are diving slowly. It gives the impression of calmness but actually the animals could be frightened and averaging the terror. Animals surfacing directly below hovering helicopter. Each time this happens animals throw flukes out of water.

1106: Animals back at surface with helo away. Helicopter lands on ship. A couple of explosive breaths and animals surface. Essentially all at the surface. More below when helo was over. 4x5 times as many fins as when helo was over them. Saw one explosive breath and thrashing tail under water.

1108: Animals [?] much rafting at surface, with head outs. Two animals waving flukes sideways. Animals turned on sides. Animals thrashing below surface and a number of tail outs.

1110: Animals about 80 yards from far corkline slightly abaft. In tight mill. School is 20m across, small group. Animal raced out of water, not very fast, leaving white water.

1111: A thrash at surface, a jump sideways out water. Another thrash, a racing just barely under surface churn of white water. *D.S. Jordan* hove to and side away net skiff in water. School very quiet. Two head slaps.

1112: End of net on deck, vibration on platform. Animals moving slowly, fair number of tail outs as animals dive. Thrashing of tail sideways in water.

1113: Some rafting behavior. Animals quite a bit closer to *CJ* now that bow bunches are in. Rings still coming in. Animals still milling quietly.

1114: Some tails thrown out as animals dive, but very leisurely, as animals average unfamiliar things around the [?]. Staying in typical position abeam, and 70-80m of far corkline. Milling, slightly abaft the beam. tail slap, thrashing.

1115: Tow boats come into net—acoustic skiff and another [?] Bill Rogers up off of bed of pain, and he is there. Leatherwood is there. Sonabuys about to be placed in net. Pushed porps some what further abaft beam. A little closer to far corkline than before. Slow moving diving and occasional thrash of flukes, but no leaping.

1116: Ponga boat into position off bow, I believe, taking line for 3rd bow bunch. Porps well abaft the beam, having been moved over there by the presence of skiffs in the water. Head out. Closer to corkline than they have been. No more than 30 m from corkline, but stretched out compared to former quasicircular shape, but still in a rather quiet mill. Schools move much further aft as sonabuoy and behavior skiffs crowd them. Animals moving quietly.

1119: Real tail slap, another flurry, another flurry of animals on its side, two head outs, nose outs, others resting quietly at surface in hanging positions, skiffs moving toward them. Many more head outs. I should say several. Little bits of white water here and there, 30 yards off on port quarter.

1120: Saw thrashing to side of tail, mass of white water. Animals in long line parallel to corks. Diving skiffs has animals directly between them and far corks. Tail slap from animals equidistant. Moving quietly for most part. Tail slap, nose outs.

1121: Shape of school has changed into elongate one now, parallel with net. Animals oriented in line toward bow, 40 yds. off vessel. Sonabuoy and dive skiff close by, astern of school as school moves away from it. Animals average terror. Blow under water. Animals quiet. Head out, pair came out together, pressed together, white water.

1122: Couple of evident breaths. Big stern bend in net, long lobe-shaped. Animals moving around in a mill away from divers and skiffs, coming into center of net. Rings up.

1123: Rings up. Nose out. Moving quietly, not too tightly spaced, fairly typical school spacing.

1124: Nose out tail out, rafting animals, moving slowly. See animal underwater upside down adj. to animal in normal position. Animals more or less in center, 70-80m away from net. Animal thrashing at surface, going in a swift circle over another animal, in a kind of chase. Second animal got pushed partway out of water in a chase. An animal twirling at surface next to another animal very close to it as if pursued by 2nd animal. I

can see pursuit under water. I can see pursued animal is a plain pattern juvenile. I saw it under water the chaser is a speckled adult.

1125: Blow under water, head out. Animals move in front of advancing skiff. Two animals racing together at surface at:

1126: Humping part way out of water 2-3 nose outs, some rafting animals, some in rolling dives without much disturbance of the water. Quiet patterns really. Rings on stripper (shock is in the corn).

1127: Animals near backdown area, many rafting quietly with noses out—hers milling around central group. A couple moving relatively rapidly. Current sweeping by with backdown area completely closed and big stern bend. Rolling net now.

1128: Animals reacting by moving from divers, some noseout animals rafting, some diving, throwing of flukes. An aggressive encounter in peripheral area (most thrashing is there and not in the centralraft) one animal hit another in the air, not very hard. Rafting animals throwing flukes. Pairs of animals occasionally coming up together, now moving between sonabuoy and far line. Boats converging on both sides of school. School bunching more tightly.

1129: Now moving between sonabuoy skiff and far corkline. Boats converging on ...

1130: More diving, school not so rafty. Three however with head out, as if hanging vertically in water. Much rafting.

1131: Animals rolling and diving adjacent to skiff, beyond them a number of rafting animals with noses out, lying at surface. Nose outs more evident. Rafting more evident. Some parts continue to dive, while other parts dive. The rafters hang at the surface for a minute, minute-and-a-half and then dive shallowly. Tail slaps fairly strongly. Thrashing at the surface with the flukes above the water. You can see that the animals were going down together in some sort of tight maneuver in which they were in one another's way. Some animals still rafting, nose out, and others circling, diving in groups of 3,4,2, surrounded on both sides by skiffs.

1134: Animals pushed up 25 m from far corkline, rafting many noseouts, a few animals circling and diving. The rafters and divers seem separate animals. Malfunction in tape.

1137: Animals are still being held against the net 40m away by two skiffs. Rafting prevalent. Many animals that can't be seen so there are many below the surface. Over against the backdown area. Net coming aboard well. Other animals come up to the surface. So there's one rafting group and one diving group. Rafting group probably has 25 animals in it. Here come the divers up, surrounding it really, and one can see the breaths of the divers as they surface. Rafters really quite quiescent. Not more than 15m off behavior skiff.

1139: Rafters all pointed toward bow of ship, moving out ahead of the behavior skiff. With some of the divers coming up under and ahead of them, but the rafters continue to raft, as well as I can see. Some parts break off from time to time, and seem to dive, but parts stay at the surfac for considerable lengths of time. A thrash in rafting group. They got very tight. I believe a diver came up under them, and ahead of them, but the rafting group continues to raft.

1140: The school is moving toward the *CJ* toward the backdown channel in a very tight raft, estimated 30 animals at surface. One can see them all facing the same direction,

some with noses out of the water, really tightly crammed together. A number of nose outs, another group came up from below. I can see another group coming up from below. Below the rafters. I think group may be even smaller than I estimated. There may be no more than 50 animals, the rafting group is 25, I'd guess. Pieces of rafting group break off and dive. Very little aerial behavior. Not much aggression, not much movement. In rafting group one can see animals with nose out, and tail down.

1142: Animals between skiffs, moving very slowly. There's one diving group that's gone down under the acoustic skiff. I can see them in the water coming back to surface, spending quite a long time down there actually. Animals rafting, being washed along by the current, simply moving along together, crowded, passively, backward away and between the two boats. Diving groups surface and directly they reach the surface they dive again (do not raft). Rafters are left at the surface. Very quiet. Just sausages.

1143: One can see the animals far down in the water. 22 animals rafting persistently, another group, maybe a few more coming up by the acoustic skiff. Animals came up in column and formed roseate pattern-like petals of a flower as I observed in Hawaii. Some animals coming up and blowing leaving quite a mist of spray blowing away in explosive breaths from most of the animals, as is typical of this time in the set. Bursts of spray from nostrils. Bursts bursts bursts. I think many animals spend quite a lot of time below the surface because the surface number fluctuated widely. The diving animals seem to be the ones . . . There is a real separation between who dives and who does not. (Later Perrin shows this to be sexual—mothers and young in rafts, males etc. in diving groups.) I can see a couple of animals hanging in the water, and I can see a group of animals below the rafters, resting down there without much movement. I can see two such groups without much movement. They come to the surface and dive again. We are not too far from backdown time. We have to get our people out of the water. I yell to them.

Steve Leatherwood goes through an evolution with the acoustic skiff—actually it loses its forward gear and he has to pull and over hand out of the net. Oh shit, Steve . . . but he made it. What in hell are you doing, Steve? What is Leatherwood doing? Against the *CJ*.

1148: Acoustic skiff moving along edge of *CJ*. I gather they are trying to leave. The animals are rafting in a very tight group, the animals touching and all tangled together. Some aggressive encounters among the diving animals especially. Animals surface in a very tight group as if they sense the time coming for release by backdown. Rafting group same size as it has been. Helicopter takes off to photograph backdown. Acoustic skiff out. Aggressive encounters common, but rafters quiescent, others diving.

1149: Helo taking off. Rafters reduced in number. Most diving in response to noisy helicopter, not far above. Animals very tightly pressed to each other, both in diving and rafting groups. Both groups in contact.

1150: Helicopter off. Rafters about the same. Rafters don't breath hard. Hard breathing a function of diving. Nets coming in again now. School still divided in two. Rafting and diving. Many rafters with noses up out of water and then quite a thrash in raft and a struggle. Most of rafters driven slightly underwater.

1153: Rafters and divers in about same proportions. Divers to surface. Backdown started. Acoustic skiff out of net 1155.

Sonabuoy in the net however. 4 came up in perfect unison. Divers doing that. Helo over low. Fewer animals now seeming to raft. More diving.

1156: Preparing for backdown, in backdown, lobe of net same rafting group facing *Eliz C.J.* Helicopter over animals. They have moved backward into backdown channel. Ever closer. Come out there to grab them. Very close to end of backdown channel. Some divers up with explosive breaths.

1157: Corks below, and animals just about to go over. Some are, some facing net, some sense release. Swimming off, nobody trying to catch an animal. Leaping through the air. One animal obtained. One on skiff. One animal just over backdown channel swimming right by corkline.

1158: Most of backdown completed. A couple left in net. These swam back into net. Most animals have left in typical leaping fashion to the southeast. Two animals remain. Fairly broad backdown channel, narrowing it. Captive animal in Avon coming up. Trying another backdown. Three boats at end of backdown channel.

1201: Single cattle egret—light airy glider.

1204: Sign off.

1220: Lone animal circling quietly in net, pretty much at surface. Occasionally we could look down and see fish milling directly under it and behind it. The porp turns sharply and cuts off some tuna at times, but the impression is that the fish follow the porp. Net 80 ft.[?] Porp out. It did not leap, but simply submerged and disappeared.

To summarize impressions of this school and its behavior. There developed a cohesive rafting group that did not dive much. It was surrounded by a series of subgroups that did dive consistently, surfacing only briefly, and toward the end of the set, diving for apparently long periods as indicated by their evident almost explosive breaths. The rafters were clearly the most non-aggressive part of the group, seldom having thrashings or white water amongst them, while chases, nippings, and other evidence of aggression were much more common in the diving animals. Not much fish—5 tons or so.

In the afternoon we performed data set No. 12.

1549: Set up pretty late, net halfway out, time off of the Greenwich Mean Time due to inaccuracies in other clocks. I'll be going out with swimming team this time.

The school was apparently about half spinners and half spotter at the start, and something like 50 spotters were lost by the bow during the chase. I sent most of my notes to the *Jordan* in a sonabuoy hydrophone. We could simply pick it out of the water and speak into it. The following then, are impressions in addition to the tape recorded by Frank Aubrey. The seas were pretty hig—7 ft. swells, though no wind to speak of, and I borrowed a big, heavy pair of fins from Warren, went down the inset ladder on the downstream side of the *CJ* (away from the net) rolled into the big Avon with Don Ljungblad, Steve Leatherwood, Rod (a crewman and diver) and Dave Holts.

We went around and slipped into the net when it was wide open, before it had begun to roll. In such a circumstance the water area is so great that it is difficult to get close to the animals, though ultimately we were able to do so. The water was full of little medusae, pulsing along, trailing their stinging tentacles. I had a T-shirt and shorts on and never felt a sting. It's an eerie feeling diving in the open sea, even though in a net. Before pursuing one knows the bottom is open and that nothing but water intervenes for 2000 fathoms or so down. But, getting near the animals dispells this sort of aquatic

claustrophobia (I'm sure there's a name for it). Almost at once I saw yellowfin tuna below, travelling in a very open school, down 30 ft. or so. Then porpoises. I'd guess the school, of 150-250 animals, 2/3 spinners. The spinners were ghosts—pale, pearl gray against the blue water. The spotters on the other hand, were much more difficult to see at a distance because of their color and pattern. At first the spinners were in clearly spaced schools, traveling with a clear distance of a foot or two between animals. Later in the set the interanimal distance closed and the animals came to touch one another. The spotters were close from the start, often travelling in dense touching groups. Spinners usually were around the spotters. That is spotters tended to be central, and sometimes below spinners. Never did they intermingle at the subgroup level. Nonetheless the school as a whole moved together. In shape underwater, one could see a surface rafting group, and then typically a columnar mass of animals extending down into the haze at 60 ft. or so, composed of tiers of animals. This mass was usually taller than wide, and I guessed that 60-80% of the animals at one time or another, were below the surface, cruising quietly. Spinners tend to travel horizontally most of the time, while spotters are much more wont to travel vertically or nearly vertically. I noted some aggression, largely in spotter groups, consisting of nipping and chasing. One adult speckled spotter pursued a plain-colored spotter out at the periphery of the school, perhaps in an attempt to herd it back into the central area.

There was much release of bubbles by both species, especially toward the end of a set. These came out in long streams of small bubbles, and I presume accompany squeals. I was echolocated, especially by one male spinner who cruised near. I saw no reproductive behavior, and have seen none during any of my observations, except maybe one example of pectoral caressing (knife-honing behavior in which one pectoral slides over one surface of a neighbor's pectoral, then under it, over it, under it, etc).

I saw definite segregation in the tuna schools according to size, and I saw the following behavior. A group of maybe 20 5-7 lb. yellowfin streamed after a spinner group moving horizontally below and in front of me. They moved past some more quiescent spotters and spinners. Then I saw the large tunas schooling together too, without references so far as I could see, to porpoises. Most of the time in the net I saw no fish near the porpoises.

Quite evident in spinner porpoise schools was positioning in which juveniles, young and subadults, all assumed the typical position of "above the midline, with beak aft of the adult" when swimming. This was not wholly immutable, and for example changed on tight turns, but was the common posture in straight-path swims.

During backdown most of these animals, spotters, and spinners alike went out back first, and seemed to have no idea they were leaving the net. Some of both species swam back into the net. Those animals facing the end of the backdown channel quickly realized they were about to be released and made efforts to get out, thrashing over the corks, sliding over, and they quickly sped away, while the others sometimes took a few moments to realize they had freedom, to turn and flee.

No porpoise were lost, thanks again to the efforts of Jim Coe. Our losses are very low on this trip. Back on board I was one of three guys who won the Sunday football pool—what does a lousy professor know about football, eh, when some of the crew know the state of every quarterback's knees, the attitude of the coaches, etc. But, there's no

justice, I guess. I was glad two crewmen shared it with me since Jim Coe had swept the field last week and we interlopers shouldn't clean out the fishermen, should we?

Anyway, the swim felt good—especially the exercise. A not especially inspiring movie and to bed.

Oh yes, most interesting of all, Bill Perrin was able to psych out from the mast that the rafting spinners were males and young (with young often below the adults in the raft). While the adult males and some others were in the peripheral diving groups. This is evident because the adult male spinners are sharply dimorphic, having sail-like dorsal fins canted forward. I strongly suspect that this sexual and age segregation is the case in spotters too, though they are not dimorphic enough to determine easily. It appears to me that we are seeing a normal pattern confined within and potentiated by the net. That is, in nature, mother-young groups are typically found in the centers of schools. They tend to be cohesive, tight groups. The maintenance of them in this position is determined, I believe, by aggression from peripheral animals. In the net aggression is largely peripheral too, and the mother-young group persistently rafts. Aggression seems heightened in the net, probably by fear and the surrounding nature of incoming threatening stimuli, and I suspect the movements of the school are mediated in this way. They average the terror, by occupying the position farthest away from all frightening stimuli.

November 1, 1976

Well, the weather is getting rougher . . . the wind is blowing, and there are some strong currents. We are pretty near to Clipperton again. A school of spotters were located.

1011: School located by helicopter, boats not in water, half overcast, swell moderated to some extent, wind has picked up 15 knots or so. There are scattered whitecaps. Bright sunny and hot. *David S. Jordan* hull down on horizon off starboard quarter.

1025: Speedboats in water, helicopter up, speedboats directly in front of us, just beginning the counterclockwise spiral (they always set counterclockwise). Boats curve off to port. Counterclockwise because davit is on starboard for speedboats and net gear is on port.

Large flock of birds, many more than over any school in the last few days. Boobies of two species—masked and browns. At least 100 birds, one long frigate bird high overhead, up among the helicopter. I see only spotter porpoises in this school. They are turning inside the *CJ* wake now. Really in pretty good position. Here come the bird up inboard of the second speedboat, a flock of them, behind the porpoises, staying behind them during set. Porps in pretty good-sized group, leaping as they swim.

1042: Net skiff inwater. Looks like a perfect set so far. Birds still flying in some numbers to rear of porpoise school. Pure spotters I think. Only 20 miles or so away from Clipperton again. didn't seem to lose many porps in set.

1043: $\frac{3}{4}$ net. Can *David Starr Jordan* reach us in time for work. Cattle egret landed on deck. Husky chased away. Hull of *Jordan* in sight. Porps 70-80 m from far corkline. I'm going up in crosstrees to see better. No differential behavior today, but will look at rafting behavior.

1050: Single animal produced a very sharp blow. Corks coming in?

1051: Still pure spotter school. Number of animals up at any one time is 25-30. Would make school 125 animals or so.

1053: Helicopter landed on deck.

1055: First evidence of rafting group, first noseouts occurring. Raft quite central, raft consists of 20-25 animals, thrashing at edge of rafting group. Other animals are swimming and diving. There is a possibility of another raft at the head of the school. Looked like raft turned and went opposite way without submerging much. Now turned and going back the other way.

1058: Fairly well -defined raft at rear of school, animals lying horizontally at surface and moving slowly. Animals ahead diving and swimming, some thrashing in group ahead. Some turning of diving groups back toward the rafters who move slowly. Thrash in advance group. Another thrash in head [?].

1059: No spinners at all. Great leap, animal falling back on its side. Some chases in peripheral subgroups, during diving patterns. Rafting group moving at rear of school.

1100: Lead line broken. Manuel in water. Eduardo in water too, going in with heavy nylon. Could have ripped lead line off. Corkline coming over the stern.

I suspect there is quite a lot of male chauvinism in porpoises, as they round up the girls and children in these central groups, with snaps of the jaws, and tail slaps, etc. Head slap, head slap, at rear of school in diving groups.

1105: Quite an evident central raft. Seems to come and go, actually. See it for a few seconds, animals traveling under. Getting corks around to stern now.

1118: Can't truly make a well-defined rafting group that doesn't seem to move and disappear. Some stay for quite a time (minutes) but they generally move below. There are other groups actively diving all the time. *Jordan* standing in now, 3 miles out. Some hope of getting here before net's all in. An occasional well-defined blow, as if the animal had taken in water in its blowhole. Watched raft stay in sight for 28 seconds, then throw flukes and dive. Stern end sweeping out behind the vessel—large. Towboat towing directly astern, first time I've seen that. Bow bunches not brought in.

1119: A head-out in central school. Most animals rise to surface, take a single blow and dive again, some throwing of the flukes. School not very evident at moment. A fairly clear raft off to one side of the school now. Nose outs in rafting group, desultory raising of flukes but group as a whole stays at surface 28 seconds.

1123: *Jordan* nearly in position. Rings not yet up. Net siff pulling to port quarter. One set of bow bunches drawn in. Quite a lot of aggression in a diving group, a lot of thrashing.

[#?]: Series of head slaps from single animal in diving group in periphery of net. Animals out near backdown area.

1128: 51 seconds rafting groups. Quite a number of noseouts, aggressive slapping on margins of aft but not in center. Rafting group in much the same location, often just below surface. I can see their bodies through the surface OK, but they don't go away or dive and disappear. Nose outs there. Still there. Underwater blow that came up as a ring. Rings still not up. See peripheral groups diving more quickly than central groups. Some head slapping on periphery. Rafts are scattered, not pushed in a tight group like yesterday. Water's a lot rougher. White caps in net. Animals leaping from the water or leaving white wakes out on periphery.

1135: Rings still not in. Skiff is in water off *Jordan*. Still not a tight raft like other day. Two tail slaps, one on either side of school. School is more diffuse than yesterday,

but typically the fastest moving animals are on the outsides of the school. Did I see a spinner? Some boobies landing in water in net. Underwater blow.

1138: Net skiff now pulling bow to port.

1140: Pretty evident central rafting group, with animals nosing out, putting their heads out, and staying at surface with animals milling and diving around them. I suspect the rough water has some effect, if only to make it more difficult for me to observe. Blow underwater at edge of raft, another out near edge of school. See the vapor of a blow by the vapor rising in the air.

1141: Fast-moving animals at edge, slow-moving animals toward the center really pretty evident really.

1142: Two Avons are very close to going in the net. Separated pods in rafting area scattered over a fairly good-sized area. One avon in net (Thompsons). Net skiff has stopped pulling and is pulling in its tow line. I think they may change positions again, to pull it out of its stern bend. Even though rafting animals are moving quietly that is not to say that they escape from being aggressive. There often seems to be some racing into those groups, and thrashing especially at the margins. Even though divers are at the net they have not entered the water.

1145: Quite a well-marked central rafting group now, animals diving on periphery. It's in the rafts that one has the majority of head and nose outs. A maneuver of a quietly resting animal rather than an active swimmer. Another blow underwater, deep.

1147: Ed tells me he thinks he saw a spinner too Much more well-developed central raft now, animals lying more or less in same direction but some helter skelter, quite a few nose outs. Animals up ahead diving and maneuvering around. No bow bunches. Bunches by backdown buoy. No divers in water. Single spinner on periphery of school. Lots of nose out behavior in central group—these animals are scattered throughout the rear of the school. Mother and half-grown in rafting group came up tightly pressed together. I can see a rafting area which is fairly evident now. Looking it over many of the rafting animals seem to be unspotted phases. I see spotted phases next to two-tone juveniles. Could be mother-young assemblages.

1153: Net size reduced by very large stern bend. Net skiff piling on stern toward starboard bow. Net probably 100 m to far corks, 200 ft. long. Chance for net collapse. Bunches out toward backdown channel. I can see in the rafting groups, either juveniles with adults or unspotted two-toned with adults, relatively quiescently. Mother-3/4-grown pair, like that. Group below me of such animals and I can see speckled adult alongside two-tone, 3/4-grown. On margins are rapidly diving groups—let's look at those for a moment—speckled animals, so far.

1157: Rings up. Speedboat pulling at stern bend. Open area maintaining itself. Clean juvenile went over to side of accompanying spotted adult, to get on opposite side of us. Rings on ring stripper.

1200: Not especially notable structure, single animals scattered around, mother-young pairs scattered around near periphery. For some reason our divers have left the net without having gotten into it. Don't understand. School pretty scattered, not tight. Rafting speckled adults. Aggressive encounter between speckled adult and small . . .

1206: Great flurry of white water at school margin. Net rolling.

1208: Another chase at margin of school Thrashing around at margin near far side of school. Some animals come free of water. Three flurries in same spot. Tail socks free, very close to net—30 ft. Underwater blow, breaking water.

1211: Animals came to surface and thrashed. More aggressive encounters, racing animals, other parts of school resting quietly. Nets been rounded up by net skiff. Perfect shape.

1215: Animals alone at surface, school remarkably spread at this moment. School spread across $\frac{3}{4}$ of available net—120 ft. peripheral aggressive encounter. Light is difficult. Chase at periphery Another chase on periphery. Animals moving on margins.

1218: Fast chase on margins. Ed says he sees a spinner on school edge. Quite a thrash, another chase. Head slap some leaping.

1228: Obvious combination of formation swimming and rafting. Rafting groups fairly constant, lying continuously. Moving groups move more rapidly than before, continuously. Quite a bit of explosive breaths, tail slaps common. Nonetheless the rafters raft. Pongas attached to net. In backdown. Animals working toward backdown, many facing in the net. Is there a rheotaxis involved. A thrash amongst animals going over net. Net 35-40 ft. wide. Backward to backdown. A group swimming resolutely into net.

1232: More animals going over, some leaping away, herd leaping, leaping, leaping.

Fishing Set No. 20. It was decided that it was too late, and too rough for a data set. People weren't ready. So a fishing set.

1530: A lot of birds. The direction of these sets is always counterclockwise. Joe is getting on the microphone. The direction of the sets is done by both brothers—Joe and Manuel simultaenously, and always at full volume with face crammed right into the microphone. There is literally no crannie of this ship where one can escape the decibels. And the volume of each instrument is up full. Everything is in overload. Either everyone is chronically deaf due to all the winches, engines, etc, or it's just their nature. I'm sure it's the latter from watching Joe. He is the Toscanini of the microphone in a death grip next to his face, the other arm gesticulating in the air, stabbing the sky for emphasis.

I should mention that there are speakers everywhere—in the john, the engineroom, the shaft alleys, you name it. I never saw so many speakers. I tried up in the wheel house, for example, to get out from under one by running back and forth, and failed. There was Joe, overhead, exhorting Luish in the lead speedboat, now coaxing him, now calling him a dumb sonofabitch in both English and Portuguese for ruining the financial fortunes of everyone on board by letting some of the school get out to the side of his racing speedboat. Luish, by the way, cannot talk back, and one can see why. With two brothers at you there's no room in the first place. Three swear words superimposed might in some transform of heterodyning come out a love feast, and that wouldn'tdo. Anyway, it's noisy

Animals pouring from the water in droves now, quite a large school. The numbers in all of these schools is very much less than estimated by the crew, usually by a factor of 100% or more. A 1500 animal school has 70 animals or less when counted.

Sure enough the animals were turned by the wake, as they get within 400 yards or less of the wake they begin to slow and to be wrapped in a spiral of wake.

1546: Net skiff half out.

1547: Net's off the stern. Skiffs coming alongside the boat. Already the spinners are on the inside and spotters occupy much more of the surface area; can't tell what this means in terms of numbers, because spinners stay down.

1554: Spinners up. Bill Perrin and I will do a dive rhythm.

1557: I guess 400 animals. Spinners up 29 seconds. Spotter doing head over tail leaps, high belly flop, head over tail leap, great high head over tail leap. Another, another, another thwap, whap, another.

[List of dives]

November 2, 1976

Brisk breeze blowing today as we move into Experimental Set No. 14. Whitecaps on water—perhaps 15 kt wind. Bright and sunny, 5-6 ft. swell, rough set for anyone in the water. Not too bad. Photographers will be in water with acoustic people. The attempt will be to photograph an echolocating porpoise at the time it is being recorded. *Jordan* three miles on our port beam. Supposed to be a mixed school with, on the order of 15 tons of fish on it.

0812: In broad circling phase of set. Some birds over set. Low flying boobies. The *Eliz C.J.* has failed to follow the speedboats for a short time, leaving a straight wake, and going out of their path. Animals almost in the middle of the circle, with a smaller group further away from us. Abeam of lead speedboat. Animals moving along as a front, perhaps 500 yards from the ship's wake ahead of them. Their behavior relative to the wake impressed me that they are indeed echolocating the environment ahead of them, since they typically stop long before the wake would become visually visible to them, or are turned by it in a similar relationship. I have, however, seen them run right up and into the edge of the wake, and slide along the inside of it.

0823: Net skiff in the water. Porpoises are slowing down on the order of 350 yards from wake, but there is still some jumping on rear end of school, but the school as a whole has slowed and gone into their "Oh Hell, here we are again" phase. Well before visual cues could be used. I suppose the wake may bubble and hiss, so that some auditory cues might be involved, but the more likely modality is echolocation.

Now the whole school has slowed. Lead animals on the order of 300 yards from wake, directly ahead of them. There is a raft of boobies sitting 150 m inside wake. Porps almost in center.

0824: Half net. Cattle egret flying by.

0826: Porps in center of net. Maybe fishermen will [?] 5-10 tons of fish.

0840: Visibility is very bad. Chop, we are in the sun wake. Quite a lot of swell. Animals are silhouetted. The operations in a set that take longest are pursuing, and sacking up and brailing. Backdown is brief—a few minutes really, even for a difficult one, and a skillful fisherman seems able to perform it without significant loss of fish up to at least 60-70 tons of fish. Above that and I'd guess there would be problems just because the backdown channel would be full of fish jostling the porpoises and some loss would be inevitable. The entire *Jordan* contingent is out. One whaler and two Avons. Good to get some exercise. A rather poor day for work, though.

0845: Skiffs at backdown area, nosing over line, or going in the net. Animals over by backdown buoy. Typical position 60-70 m from far corkline.

0847: In the absence of spinners (the school is all spotters) I am going to play with this question of rafting, hoping to get some handle on age or sexual segregation. It's an inauspicious time, though, with the light so bad though, and the largely non-dimorphic spotter to work with.

0859: A very large stern bend which is causing a reduction in the size of the net available to the animals. A lot of folding of the net over toward the backdown area. One major bow bunch. Animals on port quarter about 70 m from corkline. There does seem to be a rafting pattern at the middle rear of the school. Swifter moving animals ahead and on sides, though the movement is not swift anywhere.

0900: A raft at the rear of the school. I can see animals staying for considerable periods at the surface in this position with occasional nose-outs, which are indicative of slow movement. Elsewhere, diving, throwing of the flukes, and sometimes rather swift swimming. A distinct raft now, in which sees consistent nose-out behavior, consisting of maybe ten animals. They turn as the school turns, and their rear center position means that they tend to wheel around slowly as the school turns without much forward motion, while the outer animals may be moving rather swiftly. The rafters on the other hand may simply move with their noses out, their tails slowly sculling around. But rafting group is obvious. Skiffs moving into net. Animals responding by moving toward the stern away from the boats. A rain squall sweeping in from the stern. A real wet one (but it largely misses us, driving me and Bill for cover briefly, while Ed stayed out talking into his beloved recorder.

0912: Rings up. Animals very close to being in the stern bend off our quarter. I'm going to try to describe animals that nose out, in terms of whether or not they have spots, are bicolor juveniles, or young. One young nosing out. The central rafting group around which the others have milled—I can't see spotting on any of the animals maybe because of the light angle. A two-tone nosing out, approached by another animal, who then thrashed at the smaller animal in an aggressive encounter. Active group ahead and rafting group behind. Very hard to see if spotting is or is not present.

Maybe later in set when animals are more below us we will be able to make better and easier determination of pattern (proved to be true).

0925: Divers in water forcing them over against the corkline, moving rapidly as if disturbed by this. One animal within a couple of feet of corks. The mesh is large, and hence dangerous at this point. Animals going around the divers, one rafting group astern of the others. Acoustic skiff cuts them off from others. Front animals rapidly diving. Rear animals traveling very slowly.

We can begin to see some pattern now, as the animals move around out of the sunwake. There are five animals in a rear rafting group, a mother-young pair, another animal that swims closely with them, and then another pair of two-tone juveniles. They are separated by perhaps 30 ft. from main group now, whose shape and movements are being influenced by the acoustic skiff. One of the animals in the outside two-tone pair is smaller than the other by perhaps 1/5, in length, and they stay quite close together.

Another slow-moving pair (than the five just mentioned) includes a speckled adult and a young with a few speckles. Maybe just entering the speckled phase. A mother-young pair astern of the school. The advance animals, the ones that move rapidly, as far as can see, are all speckled adults. The mother-young pair moves quietly, the young with its nose out, the adult wheels slowly as the school as a whole wheels, under the young,

bringing the young's snout over its back and pushing it up a bit, and sliding it off, as direction of orientation changes.

Now they slip back even further to the rear of the school, and both hang at the surface with their noses out. They are part of a six-animal rafting group. The rafting group close to acoustic skiff now, so close that the animals are actually on top of one another. The school is divided into three parts by the skiffs. One part dives, and comes up with one other part. What is left now is a single pair of juveniles—two-tone animals, moving along with noses out, a third animal, speckled came up near them, and the pair slid over on another, as if getting out of the way.

0932: Defecation in water, lemon brown cloud from adults. The diver now directly under two-tones, at rear of school. One two-tone in typical juvenile posture against a speckled adult at the surface, at the very end of the school. Going into nose up behavior, left first adult and went to another two-tone animal. This pair becomes separated from the rest of the school by the Avon.

End of Set 14:

The tape failed me at the end of the set. The final circumstances were that the juvenile pair continued to hang together, even into the backdown operation, and only when backdown was in full swing did they become invisible to us in the general melee of animals. Many of the animals went out of the set backward, and some hung for a few seconds facing the net, even after being out, and then turned and began the typical leaping away from the net. The population was not large. I doubt that there were more than 100 animals all told. 10 tons of fish taken.

After the set we packed our gear, took the sheets from the bed, and got ready to leave. Bill Perrin and I, along with the normal *Jordan* crew head for Manzanillo, where Bill goes to Washington, and I go home. George took us over on the big net skiff, because we had so much gear. A safe transition to the *Jordan* was made, one world to another. Leaving the predator's world of the relentless chase, the working for however long it takes, the dissatisfaction with routine, or even experiment if it clashes with the relation between predator and prey, the ethnic group, voluble, mostly warm and friendly, taking pleasure in the day's work, to the more structured world of the *Jordan*, used to research, helping and understanding it for the most part, but also good people—largely from the Anglo world, the perquisites of sea routine, two movie showings, linen call, water regulations, less powerful air conditioning, different food (more government issue on the *Jordan*, Portuguese-Mexican on *Eliz. C.J.*)

Two cattle egrets make the *Jordan* home—weak from flight, fed anchovies, with no Huskey to chase them away. Huskey, by the way, the Huskey dog of the *CJ*, who bites a lot of people, became my pal. He was a dog that wanted to preserve his individuality and dignity, and if you took him on those terms, and said hello when you passed, he would come to wag and lay his head in your lap. A dog with a lot of interest in life—sharks and speedboat launchings were times for barking and if someone came aboard whom he didn't like, he could get so agitated barking that he would snap at whoever was near, a line that slapped him, a person. Good honest hard-working dog. Ralph, his sidekick, a shepherd, a pale personality indeed, by comparison, but just a puppy. Maybe he'll develop prejudice as he grows older.

All in all I think we learned a great deal and that our report should be a useful one. It would have been more so had it been done three-four years ago, as planned, so we could have had it to think with.

November 3-5, 1976

Enroute, Manzanillo, Mexico

When we left the *C.J.* it was 56 hours by *Jordan* to Manzanillo. And we turned our nose north-northeast on a direct line. The *Jordan* rolls more—sandpapers one in the fore and aft bunks, and the weather was rougher. Enough so the normal routines of work become mostly snoozing on the bunk, shooting the breeze on the after deck. It was refreshing to find someone who cared about the national election, which took place while we were on board. The *C.J.* cared about football, but politics didn't seem to enter their concerns at all. Bob, the assistant engineer brought his radio up and we listened to *Voice of America* and heard Jimmy Carter win. I still have the same old feelings of concern about what kind of president he will be—he impressed me as full of heartless drive, like Tap Pryor, and in spite of the radiant smile, without essential humor. Nonetheless, he appears to stand for many of the things I do, while Ford, solid and likeable, seems to me so terribly conservative that fiscal concerns are all that drives him, while the country founders without energy or conservation thrusts, and with a foreign policy that aligns us with the worst of reaction in the world. No one, it seems to me, answers to the ecologic ethic, the systemic revolution through which we must pass. But then, no one ever did, since Teddy Roosevelt, so far as I know. And then he?

Not much happening—food, lots of it, people getting their gear in order, me trying to organize the report that must come from all this, trying to get films catalogued, and so forth. We did stop at a great coil of hauser floating in the water, and looked down at the glimmering mass of fish beneath it; clouds of small gray triggers at the surface, intermixed with young *Dermatolepis*, and other fish, a mill of 5-6 ft. sharks, and beneath in the azure, the flash of bellies of larger fish in clouds—probably tuna, maybe tons and tons of them.

We've seen a few porpoises. I descended to the bow bubble and watched a single big *Tursiops* as it rode in front of the window through which I peered. It rose and fell like a marionette on a string, spun slowly over this way and that, sometimes upsidedown, sometimes on this side, sometimes on that, its tail arched downward and its flukes horizontal with the line of the tail, but without any tail beat. One had the impression of a roller coaster ride in the undulating pressure wave in front of the bow. We weren't pitching much as the sea was pretty calm, but enough to generate these fluctuations. One can imagine what a whip it would be in rough water.

November 6-8, 1976

Manzanillo, Colima, Mexico

We pulled into Manzanillo in the early morning, after lying to all night off the entrance. The harbor is a lovely circular one, and one of the only truly deep-water ports in western Mexico. It is tucked in a circular bay, rimmed with green mountains, tier on tier back into the blue of the distant Sierra Madre. I understand up that way lies Patzcuaro, Lake Chapala and so forth. The town is old—300 years or so, and much is paved with artfully set cobbles. The town of maybe 45,000 people sprawls over the flats around the

harbor, up the hills and out along the graceful beautiful playas to the north of town. We tied to the customs dock not far from the Plaza. Our aim (at least that of Bill Perrin and I) was to rent a car and cruise the countryside, both north and south. We finally accomplished the rental and obtained a disintegrating American Motors beauty, which later collapsed on a lonely road far from town amidst a coconut jungle.

But first—we took people to the airport, passing the big mangrove-lined esteros north of town. Birds were everywhere—great herons—a white version of the great blue, spoonbills, ibis, ducks, olivaceous cormorants (a little stubby necked bird that is very common) and many others. I won't recount all our adventures. Suffice it to say that we explored some waterways near the airport where we found amis in abundance—lizard-eating blackbirds like heavy billed grackles, with big heavy bills, kingfishers (looking Irish), lizards, *Natrix*, which performed according to plan, biting Bill and slathering everyone near with anal secretions. There were armadillos, turtles, peccaries, lots of butterflies—a big white sulfur like a floating sheet of kleenex (we dubbed it the kleenex butterfly), *Heliconias*, and so forth. Up one canyon before we came to a beach named Playa del Oro we explored the jungle finding many new marvels. One big *Mimosa* tree, we find is protected in a beautiful symbiosis by ants. It has highly hypertrophied spines in pairs—big black fellows maybe two inches across. Each ends in a single sharp spine, and in the older ones, those not green but dried in place, nearly every one is penetrated by the ants, with a colony of them living inside the inflated spine. They reach to outside through a single artfully placed hole right at the base of the spine. These little black ants are literally everywhere on the tree—all up and down the leaves and veins. And they bite like fire. I wonder what the biomass of ants per tree is, for it must be large. Then I walked down a little jungle-shaded road to a quarry and found myself walking on oak trees—no more than 10 inches tall, with maybe four to five leaves, each five to six inches long—a perfect *Q. agrifolia* leaf except for its remarkable size.

At the end of the short road a small creek tinkled in a granite streambed. Up one wall, amongst the bromeliads I found a congress of harvestmen—dozens of these spiderlike long-legged creatures in an airy mass, all touching each other. They shook in a sort of wavering dance in their moist cleft. When I blew on them the quavering I created swept across the entire group—contagiously. Above us, in the nameless trees, tyrant flycatchers flew, down close to us.

Once on Playa del Oro, the day was hot and the winter sun beat down with uncommon force. Most of the folks trudged off down a long, long beach toward a distant headland. I chose instead to go less far and to take up station in the shade of a great rocky inselberg that rose from the sand, part in the surf, and part in the white strand below the berm

On the sand up the beach from me there were probably two dozen big *Octythoe* crabs (spelling?). They were feeding and posturing on the sand nearby so that my field glasses let me look closely at them. The beach in certain areas where the waves had cast a rusty colored material on the sand, was littered with the castings from these crabs. I watched as they made them—small lumps of sand $\frac{1}{4}$ in. long and $\frac{1}{8}$ in. diameter

The crab walked along across the sand, sideways, dragging the tips of its chelipeds on the sand, and then when some sensory signal indicated a good place it began to feed bits of sand into its mouth by probing at the sand with the tips of the claws, bringing it to the top of the mouth, just below the eye level, which was producing bubbles

in some quantities at the time. The sand, after several touches from the chelipeds worked its way down the groove between the mouthparts and became an oozing mass that dripped out onto the ground in the form of a casting. All the while this was going on the animal stood on the tips of its claws. But after 10 seconds or so, it usually bent the claws on one or the other side, causing that side to slant downward and to hit the sand. Usually it then made a couple of quite stereotyped wiggles that pushed that corner of its carapace a little way into the sand. In this posture feeding was often interrupted for a time—2-3 seconds, often with one claw continuing to bring material to the mouth, but then full feeding resumed while the crab stood slanted into the sand. This lasted five seconds or so, then the crab righted itself, and moved on. I noted them following strand wash lines—the little marks of the highest flood of a thin apron of water at the upper edge of a wave. I saw aggressive encounters in which the crabs seemed to attempt to intimidate one another, and spent much time making castings while they faced one another.

Well, after that we went to the airport and waited with no results for the planes of various folks to come in . . . some people from NMFS, and Karen Pryor.

So, we night-drove back, after taking a side trip up into Jalisco, past Cihuatlan, a fine little town just inside the line, and adjacent to an enormous coconut plantation down on the coastal flat. We found a streamcourse north of town—Arroyo Seco, and caught a cyprinodont fish and a shrimp with extremely long chelipeds. Nice jungly scene. Nice sunset and thence home. Bill Perrin jumped out of the car when I saw a snake, and announced it looked like a viper. It was—a big pichiquate or cantil, the Mexican dryland moccasin. It lunged at Bill as he attempted to keep it from leaving the road—3 times and almost ran between his legs. I uess it was 2½ ft. long—very dark, with yellow markings and a line over its eye—and also very fierce. *Hyla?* were everywhere, jumping in very high saltations in front of the headlights.

Back in town we were greeted by a biological phenomenon the likes of which we had seldom seen. The wires on the west side of the plaza were lined with swallows spaced inches apart—by the tens of thousands—all wires filled for several hundred feet, on both sides of the plaza, up the main street. Their positions seemed nearly random—that is two birds faced this way and five that, and nearly any combination could be found. They ended abruptly at a cross arm in one case. I never saw so damn many swallows and they were defecating over everything—cars, the street, etc. I tried to convince Bill Rogers to use it for his dissertation.

Today a trek south of town down the sand spit. Our car gave out, two beekeepers helped us get it running (the transmission was ausegeput) and then a soccer team helped us push it through a puddle. A nice swim at Karen Pryor's beach, back to the boat, and home, to the *Jordan*. Tomorrow, the plane to LA, then to San Diego, and then home on Tuesday night.

A nice looking Mexican guard on our pier wants work in the US, but needs a US sponsor. His name is Ignacio Gonzales Mantodecoca; Domilcilio Conocido Salahua Col., Municipio, Manzanillo.

Granite Mountains	April 5-8, 1977
Big River	April 15-19, 1977
Villa Creek	April 29-30, 1977
Tuolomne River	May 22-, 1977
Magdalena Island	February 5-13, 1978
Granite Mountains	April 8-10, 1978
Big River	April 23-26, 1978
Villa Creek	May 5-6, 1978
Tuolumne River	May 12-15, 1978
Big Creek	July 6-7, 1978
Magdalena Bay	December 31-January 31, 1979
Northern Gulf of CA	March 2-10, 1979
Tuolomne River	May 18, 1979

Granite Mountains: April 5-8, 1977

April 5, 1977

Bunny Club, Granite Mountains, San Bernardino County

The fourth annual Natural History of California class arrived at the BC at about 1700. We had left Santa Cruz the night before, camped at Hart Flat, which provided us with its usual galaxy of trucks shifting gears, trains straining up the grade—but, a bit cold. I finally drifted off at about 1:30 AM. Then in the morning we ate our granola, powdered milk, and raising, keyed out a few flowers, and left. A really good group I think, with lots of skills scattered around. I'll append a list of everyone and something about their interests. Most have interests in outdoor education, field natural history, geology, and the like. Some are skilled with plants, others with minerals or birds. We have at least three capable guitarists and a closet harmonica expert.

We made stops near the crest of Tehachapi Pass, another in the Joshua trees to look at *Xantusia*, another at Barstow for lunch, and a final one at Pisgah. This was a great one—baby chuckwalla were out, we saw utas mating. Larry, our herpetologist, caught an adult *Uma scoparia*. The desert was carpeted with desert marigold around Pisgah, and across Broadwell Valley. But to the east the rainfall had obviously been less and fewer flowers were in evidence. Finally we cut off the Kelbaker Road to the Bunny Club road. The big bus was so long it dragged repeatedly and finally at the pond I had everyone dismount while Walt Ward drove it up empty. That relieved the situation somewhat.

We parked the bus at the top of the hill and because of the number of people all the gear miraculously arrived at the cabin in jig time. Bob had done wonders with the cabin. Windows now fold up out of the way of bullets. The new sink and breakfast table are in and beautiful. There are bunks, a nice pump, a propane refrigerator, and other goodies.

The weather is balmy—70 degrees or so, warm at night, and the nearly full moon lights up the sky while stars glitter. A good vegetable stew, some aboriginal history chitchat, a bit of music, and everyone faded out.

Brother Bob and Ginny and Maggie Fusari Asplund showed up and Jennifer. Nice to see them. Maggie seems to be running Prescott Center College. She's some species of

Dean or other. Her students do “solos” in which they may spend days alone in some part of the wilderness—on top of a mountain or on a sand dune.

Everyone is a bit tired I think and willing to relax a bit, play the guitar, and look at the moon.

April 6, 1977

Bunny Club, Granite Mountains,

What a grand snooze! The window wide open at my head, the warm breezes of the moonlit night came in and I drifted off, listening to a distant horned owl. I woke about 6:30 with the sun amber on the palisaded boulders of the Granites. The bluish hulk of Van Winkle Mt. rose off below us. People began slowly to stir and breakfast was put together. I spent my day taking groups out to observe at the pond. The first was a great success as we evolved some new ideas about the aerodynamics of small birds—is there a relationship between mass ...

The last one was less successful as we went in the afternoon to look at level flight in a couple of species of birds. The heat of the day had sent most birds in and we were interrupted right in the middle by a BLM truck driving up and Jerry Hillyer, Joe Gullickson, and a little round guy named Charlie Watson, a Nevada Conservationist, getting out. Needless to say, though I was very pleased to see the BLM guys, it pulled me away and disrupted the observation, which unfortunately needed attention. That is, the students were not ready for me to leave, and hadn't grasped what I was trying to say. I was very sorry to leave.

A nice dinner, Maggie and three of her students came up. Good music on into the balmy night.

April 7, 1977

Bunny Club, Granite Mountains

Up early and praises be, off to the dunes by 7, we were. That involved everyone eating breakfast and putting all our gear into the bus. Larry drove us over the dirt roads in a masterful fashion, balancing the big bus so it seldom scraped bottom. At the dunes we stopped near Parker's magnetite sand mine. (He has a new creeping magnetite sorter that looks like a bulldozer. I can't imagine that it isn't grossly inefficient, when boulders they throw away up at Vulcan Mine contain a ton of magnetite and they are scattered all over the landscape.) We set out for the high dune across the creosote flats. Larry Minden turns out to be a card-carrying herpetologist and proved it by vacuuming up everything in sight—a horned lizard, a leopard lizard, a tortoise, an *Uma*, and what else I can't remember.

Fortunately the air was cool so the hike up wasn't too arduous though I did puff a lot and have to stop every 40 steps or so. At the top Ken Hart gave us a good talk on sand dune history and structure, and we looked off across the desert to the north to see Soda Lake and the Mojave River that are the sand sources.

It had warmed up and various folks had shed various clothes at the base of the high dune. To shed a top seems a special joy to a girl who must wear it under most circumstances.

Then we lept off the dune and it hummed for us beautifully (actually I've heard it louder—there was a moist layer not far down). A lot of us slid down the hill with our ears below the sand, listening to the mountain boom.

Back across the sand we went looking at tracks, refrigerator plants (*Rumex*), termite nests, umas, and such.

Everyone was hot and sandy so the vote was to try the Vulcan Mine for a possible swim. Larry got us quite a long way up the Vulcan road before it disappeared under piles of cobbles and alluvium. The road is nearly gone undercut in many places and overwashed in others. We finally stopped $\frac{3}{4}$ mile below the mine—turned the bus around, and then hiked for the mine. It was a fairly brisk hike up though the air was cool, thank goodness.

Very few flowers are out here though the soil is wet and there is promise in a couple of weeks. Some things are in bloom though: *Phacelia campanularia*, *Castilleja*, *Sphaeralcea*, *Amsinckia*, *Lotus*, *Eriophyllum*, and many more.

The lake in the glory hole at the Vulcan Mine was as full and clear as I have ever seen it—deep, green, and mostly free of algae. Most of the bottom was water, except for a [?] of rocks and soil at the SE corner. The water was cold (15 deg. C.) but everyone enjoyed a good swim, a chance to cool off, and to get the sand and crud off.

We walked back to the bus, drove back to the cabin for another observation hike, and then dinner and reports.

It's a nice night, the group tightens, and gets to know and enjoy each other. The group is the most skillful I have ever taught and gets on very well together. Not a ringer in the crew

Big River, Mendocino County: April 15-19, 1977

April 15, 1977

Hopland Field Station, Mendocino County

This trip is to the Big River estuary that enters the sea at Mendocino. We will do some survey work in the area with Jim McMillan, his wife Valerie, and their crew of young people who are trying to save the area from decimation by logging.

I was very lethargic all day today—snoozing on the bus floor part way into Marin County and really never getting with it all the way up to Hopland. We had a brief stop at Pescadero Slough to look at birds. There were many—ruddy ducks, red mergansers, a single great blue heron, a snowy egret, pie-billed grebes, coots, and on shore beautiful little yellowthroats zipped from fenceposts to reeds. Dull metallic blue-backed tree swallows swooped overhead. Up on the dunes we looked at the strand flora—*Abronia*, *Artemisia*, dune bush lupine, and a good many others. The New Zealand dune grass is taking over however and seems to crowd out the natives.

At the Audubon ranch by Bolinas Bay we were able to sandwich our group in between a couple of school groups. It's an interesting place. A nice trail leads up through a hobbit forest of gnarled oaks, firs, redwoods, bay, with a quite diverse and luxuriant understory. Pretty big patches of Douglas iris were in bloom. Finally we came to an overlook with benches and a telescope where we could look down into the canyon in back of the ranch headquarters. Perhaps 24 great blue herons and one American egret

were nesting, their stick nests set on the pruned tops of a dozen redwoods. The trees were like big green platforms that easily allowed these big-winged birds to land without the hindrance of branches. The birds kept the platforms clear and may even kill the trees involved. Each nest tree had dead branches evidenced at its top and some had brown or dying foliage in its upper reaches. Why this should happen escapes me yet. But we did see birds pruning live twigs free and working dead branches into their stick nests. The nests were spaced—probably 8-10 ft. was a minimum distance between them. There were two or three nests set back in the side branches of tall trees well below the crown. All are open to the side so the big birds can easily fly up, fold wings, and land on lateral branches, but obviously these are suboptimal compared to those on the platform crowns. The birds were in several stages of reproduction from circulation of the big blue eggs through rearing chicks almost ready to fly. The egret was hard to see, being down behind another nest.

Down the Alice Kent trail we traipsed and had lunch by the lagoon, where we watched dowitchers, dunlins, turnstones, and sandpipers working the mudflats. I wondered how these flocks knew when to land, or how the information spread through the group in so doing. It wasn't easy to see, but some things became apparent. If a group flew up to an area already occupied by larger birds they sometimes swooped down as if to land and then didn't as one or more birds swooped back up. The signal was transmitted to the others and the whole flock moved off. It was sensory integration just as with a porpoise school.

At Santa Rosa we picked up Dave Hart at his parents' house. Nice folks too—we used up about 40 gallons of their water filling our water jugs. Finally we reached Hopland and turned off to the east toward the 5,000+ acre agricultural field station. It lies on the slopes of the coast range extending from about 600 ft. above sea level to 3,000 ft. It encompasses valley oak savannah, live oak, blue oak, and Kellogg oak forest on the lower slopes and chaparral on the upper slopes. Al Murphy, the manager, put us up in the bunkhouse (we cooked there) and slept under live oaks, outside to the music of a frog chorus down in the defile nearby. The hills are lush with grasses and the thousand or more crossbreed sheep look fat and lambs numerous.

Good reports and guitar music and then to bed under the starry night. It's a great group with amazingly accurate and extensive expertise, and much warmth and good spirits for each other. There are so many I've grown fond of it's hard to pinpoint them. And so responsible. No one is late. No one messes the camp or is inconsiderate.

Chris Brown met us and it was fine to see her. She seems to understand herself better than she ever has and to be more at peace. It seems that her teaching with delinquent kids at a nearby Philo school is proving rewarding. We talked of this and that and drifted off to individual camp spots.

April 16, 1977

Big River Estuary, Mendocino County

Up early for folks and a tour of Hopland. A very knowledgeable grad student from Davis (Mike) told us of their work on brushland conversion, stock culture, and predator control, grazing phenomena, and his own work on the utilization of oaks and their fate (most aren't establishing new trees, perhaps because of the pressure of grazers who eat the seedlings and acorns).

Bob Timm of Berkeley told us of his work with coyotes while we watched a young female pace in her cage. Delicate-looking, nervous animals they are. She shied at the wind passing through the trees above and paced in her path around the cage. They kill, Bob said, cleanly, by biting the neck of a lamb, and hanging on until the jugular is cut. Dog packs are messier and come up from behind usually. Most coyotes will kill even though full. Movement (running away) keys the coyote to attack. They account for about 12% of the local lamb crop, and maybe more. They dig under fences for the most part but may go through mesh as small as 6 x 4". Bob said he saw a coyote go at full speed through a 6x6" mesh. They can also jump, and electric fences, except the most high-powered, don't faze them. The most effective means of control seems to be chemical traps that are baited with coyote urine. The sniffing coyote tends to mouth the bait and a sodium cyanide pellet is popped out into the mouth killing the animal within a few feet.

On we drove through Booneville, past the Moonie Ranch, and finally to Van Damme St. Paul pygmy forest. We had lunch (splendid potato salad amongst other things) and heard about podzol soils, ancient beach dunes, emergent coasts, and the whys and wheres of Bolander's pines (a subspecies of lodgepole pine), Mendocino cypress, etc.

Then off to Jim McMillan's place out the Comptche Road that runs along the south [?] of the Big River estuary. His place is reached as follows [map].

Jim emerged from the scraggly pygmy forest to greet us, as did his plumber-man of all capabilities, Jim Naukunas, and his wife Valine. We never did get to their place or their glass furnace (Jim is a glass blower), but off we went to the estuary mouth to launch our flotilla. Jim said he had six boats including the *Naiad* waiting for us. Sure enough. There was a canoe, a paddleboard, two plywood skiffs, one with new pitch on the bottom to patch some particularly inelegant holes, and the *Naiad*, which is a 14-ft. runabout (fiberglass) with a little cabin and a fine vintage seagull engine. Then we had two—a two-person rubber raft and my redwood freight canoe. Gear was unloaded, great piles of it, food in boxes, our library parnassus, the cooking gear, collecting gear, and sleeping bags, guitars, and 28 people. The *Naiad* was crammed to the guards as was everything else and most people walked on the road that runs up the river canyon. Dave Hart, Valerie, Jim McMillan, and I perched on top of the *Naiad* and we pulled up, pulling one skiff containing Leslie and "the other Jim," a long, lanky guy full of good humor.

The canyon is steep walled, perhaps 30 degrees to the slopes 600 ft. above, and clothed with conifers—Doug firs and redwoods, some grand firs, while the river's edge is bordered with alders and bays that often sweep out over the water as limbs and leaves reach for light. The tide rises and falls 5-7 ft. leaving muddy banks often covered with a tangle of snags. Grasses clothe the banks above the tide, as do nettles, poison oak, berries, and many other herbaceous plants. Patches of horsetail rushes are common. There are some mudflats low down with pickleweed flats near the entrance.

The water is greenish and murky and somewhat saline quite a long way up the channel—at least seven miles.

Most people hiked the road and we ended up at a bend in the river where we could climb a 10-ft. sandy bank to a flat along the river in front of a second-growth redwood grove. Jim's crew was there—a group of kids from about 10 to 16 whom he is teaching about the river and attempting to instill with ecologic ideas. They were bright, imaginative kids, I thought, peering at shrimps under the scope and wowing at this and that.

As darkness settled, people chose places to sleep on the soft redwood needles under the towering second growth redwoods. Talks, including animal and plant topics were given—good too. Then some good music and off to bed under stars that just came out after a bout of mist that scared me a bit for fear it might rain. I drifted off quickly enough.

April 17, 1977

Big River Estuary, Mendocino County

Today we went off on various survey tasks, some of which met with success and some didn't. The group that had trouble was the water quality group that went upstream in the *Naiad*. The Hack kit for salinity testing works only in fresh water. Too much salt requires too much solution for titrating, hence they only did one or two stations. Then, my impression is that the *Naiad* goes mighty slow.

I guarded camp most of the day, but toward the end went upstream with Jim No. 2 in the redwood canoe (which we brought up suspended inside the bus from the luggage racks—a tight fit). It was a nice paddle. Jim is a boyish guy who laughs easily and has great capability. Up around the bend from the bridge to the south were cut banks in the mud with big redwoods above and bay trees hanging over the water reaching out for light, 200-250 ft. over the green water. When their leaves and branches touched the water it was as if poison touched and burned them. The branches were bare below water level and tufted with debris of the floods. Most were trimmed off as with a scythe, like a bobbed haircut.

We cruised along close to the mud banks in the dim light. A mink slid down from the grass to the mudbank at water's edge. This 15-20 in. animal was dark chestnut brown on its back with a somewhat tufted tail, a bit darker than the lustrous body. The little animal loped along the mud bank at the water's edge. It moved just like an otter, undulating along the bank, over snags, between branches, and finally after we followed him for 100 yards or so, it cut up into some debris and disappeared. Not long afterward we flushed out another one, on the same bank and chased it almost to the *Naiad*, taking samples way up the river, but mostly spinning around as various people tried to row in various directions. Not so coordinated, I'm afraid.

Those beautiful animals! So pursued! But still free, doing what they've always done. How many people in Mendocino, even, would want to kill them, given the chance. How much better to leave them alone.

We looked at a marsh back of a bend of the river—[?] by a mud bank from the river below with its tidal salt. It was fringed with cattails and filled with water lilies all in bloom. It was *Nuphar polysepalum*—bright yellow. Its pistil is remarkable—fringed and shaped like the head of a cold chisel, and ribbed with stigma tissue.

Back at camp—dinner, good reports, and talk. We heard some good talks about the local aborigines—Yukis to the south and Pomo here. The Yukis were pretty subordinate, without contact, except by trade, with the sea, and a very separate language. In fact no one seems to know where the Yuki language originated though Pomo was an Athabascan language allied to Navajo and others.

Things are goin' good on the creek side.

April 18, 1977

Big River Estuary

Today everyone goes out on his or her own. I went with Teresa, Vicki, Leslie, and Ken, down the creek to Mendocino.

We set off in the *Naiad*, stopping at various places to look at this and that. I pointed to an extensive pickleweed marsh, saying that later in the year it was alive with mosquitos and unlivable for a human, but we could go look at it now. We all trooped out, tying the *Naiad* to a snag. Not far out on the flat we came to some shallow salt ponds. I stopped to look at the life in one of them and found a microcosm of life and death and struggle for survival. The pool, perhaps 40 ft. long and 20 ft. wide, was matted with algal mats along the border, had a pink algal scum on the bottom, and was about 2-3 in. deep. On the surface film were hundreds of brine flies gathered in tight groups—dozens and dozens along the pond margins. As little gusts of wind whipped across the pond surface these groups would sometimes swirl out across the slick surface film only to pile up on another algal mat. Some stragglers would spin off by themselves. One impression was how terribly slick the surface film was for these tiny animals. It must be like the slickest ice.

Then we noticed spiders everywhere in the pickleweed and out onto the surface film. These very much heavier animals dented the film with each leg as they ran and seemed quite inefficient at movement, like a man running on a trampoline. Look, they're attacking the flies! Everyone was on hands and knees watching. A spider would race out from the pickleweed, rush toward a mass of flies whose members were so close they seemed in direct contact. An instant, and a fraction of an inch before the spider could catch a fly, they leapt into the air and descended after the spider passed. Not a fly was caught from these aggregations while we watched. Sensory integration at work!! But, when a spider spotted a lone fly that had been spun out over the film away from its fellows the spider made a direct dash at it, over it without the slightest pause, picking it up somehow as it rumbled over (under one or maybe several armpits?) and once on the bank bringing it out and feeding on it. How neat! The lone fly lacked the senses of his fellows and was easy prey if approached from behind. Even the waves in the surface film that must precede the spider seemed no warning. How does a fly sense them? What do they consist of?

One spider came up a branch near me and threatened me by rising up on tiptoes and walking stifflegged toward me, all eight eyes focused on me (or so it seemed).

On down the estuary we went to the flat above town where the houseboat *Ganymeade* sat stranded. Eric Erickson occupied this funky craft, with bunk and woodstove, pregnant cat named Bertha, nets and fishing gear, and various art objects. He was quiet, 30ish, perhaps stoned, I don't know, but hospitable enough, and a good friend of Jim's. He'd been on [?] to the flats eight years and had moved his house up or down a few miles at times.

I bought some groceries and then hiked back on the trail. The *Naiad* didn't arrive for a very long time. She'd broken a spring in the outboard.

I relieved Larry who went off on a hike.

April 19, 1977

Big River Estuary

We packed up in the morning and headed downstream. I was on the ragtag navy that hauled gear down and we were caught by the tide and unable to make real progress against it, for a long time. By shifting the load and hooking both powerboats together, we finally arrived, loaded the bus, said fond farewells including a hokypokey to the McMillans and left down Hwy 1.

Home at 9:00 PM or thereabouts.

VillaCreek, Carmel Valley: April 29-30, 1977

April 29, 1977

Upper Cruickshank Camp, Villa Creek

Here we are again at my old favorite, Upper Cruickshank Camp, this gentle, subtle, varied, and lovely piece of wilderness. And in the company of good friends, too. The mandolin and guitars sound under the bay tree over by the spring—the two Dans picking away. The fire pops and crackles amid the chatter of ShooShoo, Teresa, and Vicky sipping their after-dinner cup of tea. I cage a nice hot cup of tea from Teresa. The light fades after a fine day. Yesterday we came down the coast, stopped to see Margaret Owings, who told us of her history as a conservationist, fed us cookies, and showed us her fascinating house which perches on a fin of rock 300 ft. up from the crashing surf. Six gray whales appeared, gamboling in the kelp. There were at least two young, perhaps 22 ft. long, amongst them. That's clearly where they are on the northward migration.

On with various attempts to contact Patrick Cassidy who rents the Bateson's house below Villa Creek. No luck, so we simply parked up near the trailhead and trekked up the switchbacks and thence up the canyon trail. It's a dry year but many flowers are out in the chaparral. The old burned redwoods and some oaks have begun to swell in girth after the fire, producing long, vertical cracks in the bark with new clean bark underneath showing through. One could time girth growth or fire occurrence by learning about these fissures.

In the morning today we put up the sweathouse down by the creek. I wrote in my notebook and then Larry and I had a grand hike up the north canyon wall of Villa Creek and over into Alder Creek to the north, stopping when we could see the old mining district on its N. branch. (Krenkles Ranch, Los Burros Mine, Dulcimo Mine, Melville Mine).

We missed the trail where a switchback had been washed out and were forced into a bit of bush whacking but soon found the trail again. Deer sprang out of the bush ahead of us. One stood in the tall grass, its ears focussed on us and then sprang away, bouncing upslope as if on four pogo sticks. We passed through a copse of burned ponderosa pines with a forest of young trees. Judging by the whorls of branches they were six years old, or sprouted just after the fire. How does a ponderosa pine become potentiated to sprout by fire? Are seeds just devices that are ready for use in case of fire?

On up the canyon we went through little hanging valleys, where Larry and I dreamed of camping, raising pot, or setting up a still. As we approached the mining district we began to notice a tree we couldn't identify, all burned out and finally we found some new shoots that told us it was a golden cup oak, *Quercus chrysolepis*. On the way

back a purple martin female volplaned back and forth to the dead top of a redwood. Nearby was a single newly constructed hole in another burned tree. Do they ever nest alone?

Back at camp, dinner, and some fine discussions of what people had seen during the day. Foxes, yuccas (we have a *Y. whipplei* with a long rhizome here). We ate the new stalks—rather sweet and much like asparagus. Some were later steamed over the fire and they seemed even more asparagus-like. In the evening after reports, three of ours were still missing, but I wasn't particularly worried on their account since they were amongst our most capable and jet-propelled field folks—Bruce Stein, Helen Gibbons, and Brett Hall. They were trying to make a circuit up to the main ridge, along it to the north, and down Alder Creek and over. But they couldn't make it and ended up rock hopping down Villa Creek, which must have been a horrendous task in the dark.

Much steam, more rocks, cooking the sickness out of John Carothers who sat the whole time in the corner bleating for people to warm it up more. A bare hokey pokey, up the trail in the moonlight, filtered down through the tall spires of the redwoods. Then, a little quiet guitar and to bed, a bit sore but otherwise happy for my group was complete. Larry was a joy to hike with, gentle, full of pleasure at little things, caring.

Tuolumne River, Tuolumne County: May 22-, 1977

May 22, 1977

Tuolumne River, above early intake, Merced County

It's 6 PM and my last full day with Natural History Class 1977. We've just returned from a hike up the stream to a beautiful falls and an even more beautiful meadow and series of pools—small lakes really—all dark forest green in the deeps and amber over the granite boulders.

Somehow I haven't had time to write before on this trip. In part I was too concerned that it should turn out well for us all and in part there were so many questions, little tete-a-tetes on the ponderosa needles by my camp, or contemplation, jokes and warmth in groups hunkered on the trail in the dark sharing a joint and bits of chocolate, or just silence under the silhouettes of the trees, cliffs, and the stars.

How has it been? Rejuvenating for me, yes. Fun, yes. A chance to see and understand, yes. A parade of finding and discovering warm and loving experiences together, yes, most of all I think. And, no one, I suspect, has found more than I have. We're shared so much and our group is so rich, it's hard to tell.

Rich, that I can say for sure. Never have I traveled with a more talented group who knew, felt, learned, and perceived so much. There is no one who does not bring some special perspective or set of ideas or skills, or philosophical constructs, to us. No one who disrupts or must be compensated for.

What I have I've pretty much given, I think. Some ways of seeing, some scope and sense of time and pace in nature, spirit, belief in joy, belief in simplicity and the oneness in us all, and our oneness into every cranny, men and women. Some sense that in nature is not a chance for science, but also for philosophy. That true things are what matter and must for our ethics and our understanding of ourself. That being small and yet

part of the sweep of time, of the mountains, valleys, and forests, the creosote flats, the willing river dimpled by current, is magnificent beyond telling, touching everything we are or can be. That no person lacks something to say, whether it be through the joy of finding, like the children on the bank of Big River peering through our cloudy microscope at mysids bearing eggs, old Byrd and his bumper stickers, or that brave devout lady on her fin of rock down in Big Sur filled with indignation when officialdom dare to declare a bounty on her mountain lions, or her otters to whom she reaches out when they play in the kelp, 600 ft. below. Or to gentle Jim, Oxford scholar, artist, glass blower, fragile figure in the slash of the pygmy forest insulating his house with egg crates.

What did we see, hear, experience. So much I can't do more than draw a few examples.

Our group clustered on the Bunny Club deck not wanting to leave because so much remained to be discovered about everything. The peregrines, the *Opuntia* whose spines play tunes, the phainopepla whose adhesive shirt ties together two organisms so they cannot separate. The sand mountain that sends its Om out to us all and when we listen we hear a directionless throat of that mountain's being—constant, sending its vibrations into all of us.

Up to Vulcan, where John Carothers reveals his role as our resident gymnohiliophile, like I imagine Ishi must have been up in his canyons and oak trees.

So much, so rich, so scarcely touched by us.

The Big River, its ebb and flow, the history of exploitation, told in the layered muds of its banks. But out there on the pickleweed flat in that shallow pool where fat egg-bearing spiders thrash across the slippery surface film and through the massed brine flies all touching elbows and sending messages of fear ahead in the nick of time. But when the tiny eddy of wind sent a fly skating across that glassy, icy trampoline, it was caught in an instant.

Or Sandy, Larry, and Bruce's spiralling osprey. Or the trial by nettle train over which Dave Hart directed everybody to camp. Or the undulating little mink trotting on the riverbank and disappearing beneath a great redwood root.

Who could, for heaven's sake, forget that incredible ragtag navy, led by Teresa circling in lazy aimless vortices at the mercy of the silent tide? Pots, dipnets, one lone oar and faith in jet propulsion got it home, plus Leslie's attention to water seeping inexorably in through the tarry seams.

Or our group, ascending the switchbacks to the Cruickshank Camp, that gentle, sainted spot under the oaks with the indian shellmound meadow adjacent to the ruins of the Cruickshank house up the hill under the ancient apple tree.

Or Dan and Ken and Lori clinging to the cracked rock hillsides to psych out the yucca, taste its stalks, count its poker chip seeds produced in such profligate numbers, or its candles drifting their perfume in the passing air, luring the companion moth that is a part of the yucca as the yucca is part of it.

Or the crazy naked dance in the firelight around the roaring fire at 2 AM after watching the moon through the roof of the sweathouse.

Fog crashing in silent 400-ft. high [?] and pouring up through the canyon as quiet as twilight and then receding again.

Larry and I go off together to discover a hidden valley for a future camp, or a place to raise pot, a sequestered little eden of oaks, grass, and young pines tucked in the hills.

Larry, the gentle caring Larry, who means so much to us all but who did so much more than anyone knows when I couldn't and even when I could. Robert Redford to some, but better, a balance wheel, a spirit, a partner up to Tuolumne, after a beautiful, austere look at the scoured spine of the Sierra where we try to understand the things that happen to build a mountain or the things a tree does to live there when chilling winds sweep by, scalding the soft parts of plants as if by heat, the snow a blanket as surely as my sleeping bag, branches so pliant one can tie a knot in them.

Leslie and I talk geology, trying to understand in our own way, regardless of the conventional wisdom of books how this scape from the Colorado Plateau to the sea might have come about. I think we may be as close as anybody in what we concluded. Leslie, so inquisitive and full of ideas, it was fine, Leslie.

Then down to my gentle river. I hoped with Craig that it wouldn't be dry in the drought and it would be as I remembered it. It was. A lovely various parkland of oaks, pines, an alder-bordered stream, the towering cliffs above.

We pretended to be insects, or lizards and to try to see and sense the world as they do, with our thermometers or Ann Hoover's grass and hair wind gauge, or the light meter. It worked. Everyone perceived and then knew that there were worlds too tiny for us, of almost infinite variety within yards of our camp. An ice box at 12 degrees C. back under a boulder where only liverworts grew and 120 degrees or more on the soil surface. Trees emerged in terms of the strategies of leaves at using and transmitting light. They are stiff on their petioles or wave in the wind for reasons. Trees have shapes for reasons.

Shoo Shoo, Lori, Leslie, Carolyn, Bruce Stein, Paul, Steve, Nirea, Ron, and I went on a wild walk upstream that led to a percussion band being formed, aboriginal costumes of the most basic and incredible amounts of noise.

I don't want to be caught up in writing a salute to each of you for the good things I've seen and shared and gained. That's too fraught with the problems of comparisons. To chance that I won't be able to express the singularity, the warmth, the spirit, the insight I see and feel in you as individuals. It's too risky. So, suffice it to say, my love and respect and anxiousness that it not stop here to each of you.

Thanks, Ken

Magdalena Island, Baja California: February 5-13, 1978

February 5, 1978

Lopez Mateos, Baja California del Sur, Mexico

Here it is five days after we began this circus and we are still not yet on the island, nor are our tents set up, but instead we are moored alongside a disabled purse seiner at the dock. But, things are looking up. I think we will do those things in a couple of hours, plus most of the day to complete it.

It went like this. I flew in to La Paz, stayed at the nice Los Arcos, a couple of steps up from Las Perlas. I had a good marisco dinner, a bottle of wine, and Bernardo and William showed up, having driven over from the Universidad Autonmia de Mexico. Next

morning, we drove in their panel trucks to Ciudad Constitucion, and then to San Carlos. On the way we counted auras or turkey vultures. Pesticides are eliminating them from the mainland landscape, especially their near relative the sopilote, or black vulture. Here there were many auras, even around the cotton fields of Constitucion, where DDT use is rife. It may be too new a farming area.

At San Carlos we located a landing ramp, tended to papers with Sr. Armas (who was very helpful). We had one paper we had to call for to Mexico City—boat permission to ply the waters of Rehusa.

Our launch site was east of town near a little complex of cabins run by an American.

About that time the boat came in dusty but with a happy crew. They had come in after an uneventful trip down. We tried to compensate the compass (or Jim Christman and Bill Rogers did) and in turning in the soft sand got stuck. It was then I realized the weight of the boat and trailer—pushing, 10,000 lbs. (our boat, the *Naia*, is on her maiden voyage—she is a 25-ft. skipjack fiberglass twin-engine out drive). It was dark so we went to bed to wait for light.

In the morning we unhitched the trailer and spun it around on its caster wheel resting on one of our camp tables. It worked well enough—not nearly as difficult as digging the big truck out repeatedly. Then, launching was attempted, after completion of compass compensation. The wheels dug ominously in the low mud but the vessel was launched successfully. All hands were joyous at seeing her float and seeing the empty trailer pulled easily enough up the sand ramp. Nonetheless everyone, I suspect, certainly me, thought about the day when we will have to extract her to go home.

February 6, 1978

N. Tip of Magdalena Island, Baja California del Sur

By this time the Ruchs and Schevills had come in and joined us. They came in Jim's mighty Volkswagen, which for some obscure reason can not be shut off, so it putted away while we talked. They chose little hills to stop it later and each time it required a push and deft clutch work. Leaving them on the beach, William, Bernardo, Bill, Jim, and I set out for Punta Tosca and the Rehusa Channel to make the first camp run. My but the *Naia* was loaded, and my, but she was slow. Cut down from her majestic 20 knots on a plane (and 30 knots in the literature, which I suspect is performed on a specially flattened lake). We picked our way out of the channel by the anchorage, going south toward the entrance of Magdalena Bay, finally going over the shallowest place at about one fathom under the keel, and then into the deep basin of Magdalena Bay. It was duck at the entrance, and lo and behold the light on Punta Redonda, which is shown on the chart, was not lit, while one not shown on Punta Entrada to the north blinked away. Oh well. So much for the reliability of navigational markers. We turned past the half mile of rocks that jut out from Punta Redonda and slid down along the long straight shore of the outside of the Isla Santa Margarita. It was fairly calm, with just a long and rather flat swell, but poor William, who is terribly susceptible to seasickness, became whiter, then greener, then inverted, then horizontal, then fetal, in which shape he stayed until we anchored, and even beyond. Bill, who is also susceptible did well until just as we rounded Punta Tosca, and then he too succumbed with a vengeance, not wanting to live, and pleading to sleep ashore regardless of what it took to get there.

I spent some time trying to organize the incredible tangle of gear down below decks, and nearly succumbed myself, but was able to excavate a couple of usable bunks. We slid around Tosca at about 11 PM, and then up behind. There were four bait boats, their well-lights on, and crewmen jiggling over the stern. They had the only decent anchorage and shouted loudly that we should not come in. We chose a much less satisfactory anchorage 300 yards or so from the breakers crashing over the bar at the entrance to Rehusa Chanel. I could see the wind whip the crests off into long horsetails, and hear the mumble of waves coursing along the beach and rocks. Not good, I thought, maybe no chance to land. There was scarcely a place to sleep. I chose the cambered foredeck, propped my head up with a lifejacket, and picked up what I thought was my sleeping bag (which turned out to be Bernardo's), lashed a rope across myself, and tried to sleep. Some exercise! The boat swung on its anchor, sending the mouth of my sleeping bag into the wind like a wind sock in an airport. I rotated accordingly, attempting not to fall off into the water. It wasn't comfortable, but I made the best of it by propping my head up enough to keep the camber out of my backbone. Down below William and Bernardo slept, and Jim stood awake most of the night worrying about tides and currents. He did get a few winks toward morning. Nothing I seemed able to do induced him to have us stand watches.

Next morning William and I loaded the avon raft and headed for the beach at the foot of the place I had chosen for a camp. We made it OK, and landed a lot of food, but in looking back at the unfurling three-foot breakers I knew we would never make 30 such trips without misshap. It didn't take long for me to reflect on my team of folks, only a few of whom are young and resilient, to realize that it was a mistake to try to land. We pondered the storm offshore, the tides and wind, and a bank of fog pouring in and decided not to try to land on Isla Cresciente, because Jim was rightly afraid of the waters and didn't know them. So, reluctantly, I called it off and turned back up the coast, to try to make an observation post on the north tip of Isla Magdalena. Bernardo concurred in this plan, which helped, so off we went back to San Carlos. The uneventful trip took most of the day. That night the ship lay at anchor off the launch point, waiting for a full day's time to run Devil's Bend.

In the meantime we visited the local restaurant and had a fine meal of lobsters (some folks), shrimps wrapped in bacon, and other goodies. It took forever but it was worth the wait. I rented cabins for the night so people could shower and sleep out of the sand (we would have plenty of the latter later on).

Next morning we waited on the tide, letting it drop from a very high level down almost to low for running the channel. That way the channels would be easier to see—which turned out to be a very smart move as there were quite a few places else where the uninitiated could become lost (and we were uninitiated and in fact, without a decent chart). All we had was a mimeographed sheet of the general contours, given us by Fernando Armas. The ride up started near the entrance channel at upper Magdalena Bay with an encounter with a school of *Mobula*, or small mantas, all cruising along with the tips of their fins flapping out of the water. They were amidst a school of bait fish and birds and flotsam—eelgrass, mangrove seedlings, etc. Who was feeding on whom was hard to tell. The mobulas let us cruise over them and we could look down at them flying underwater, 18 in. across the wings to maybe 24 in., their blunt heads and palps showing on the heads. They dove and we left, cutting on up the channel between mangrove

swamps, the channel marked by shallows and a winding channel that wove back and forth between them. A couple of times we stranded on the flats and I am very glad we chose the low tide to make the trip as there were many false channels that were very evident at low tide but that would have led us off into the blind alleys of mangrove channels if the tide had been high.

Devil's Bed is a truly impressive bend, about ½ a mile across marked by white cans moored on the flat, with a channel that can't be more than 200 yards wide at the widest and I'd guess half that at the narrowest. How a 110-ft. ship makes the turns escaped us all.

On past Colina Coyotte. At low tide, as we knew, it would be devoid of whales, but just beyond we would see many in Bahia Grande. There they were. I spied a pink thing on the water and announced it was probably the whale placenta—as we approached closer it materialized into a mass of netting. I told Bill Schevill I'd surely never hear the end of it. And I suppose I won't (from him at least).

Finally we made it to Lopez Mateos to find the folks at the dock waiting. We told them we would go on and land on the island at the north shore of the Boca Soledad and Jim would return.

Off we went, and Jim balked at crossing the channel back of boca at dusk. I understand his fears—new and dangerous water, darkness setting in, so we turned back and found our people having loaded everything on the deck of a purse seiner. Jim Ruch was there gesticulating because he had just carried five 20-gallon drums of water across two boats to give us a place to load, and he faced the probability of taking them back. Luckily the boats were to be moored for two days due to mechanical failures and we could leave the stuff on the decks. So, we located places on deck to sleep and then went off to the Casa Dona Maria, a Casa de Huespedes in town down a couple of dark dusty streets. It was spotless but all they had was refried beans and chorizo (sausage and eggs) and vitas. Good enough, and then some sleep on the deck of the seiner. My ribs were sore from sliding off the roof the *Naia* and my back sore from lifting stuff. I had to turn myself over by reaching and grasping the sampson head of the winch above me and then flipping. If I dared to try it just by turning, my intercostals yelled out for all they were worth. But, I caught a few winks and was ready for the day.

February 6, 1978
Camp Sand Castle, North end of Magdalena Island, Baja California del Sur,
Mexico

The above name is no joke. This typewriter damn near fails to work because it is choked with impalpable sand that drifts in as the NW wind whips around our tents and fills our food shelter. I have to lock the typewriter away elst it get so full of magnetite sand that it ceases to function altogether. I work each key loose like an arthritic joint till it comes free and functions. I know when it is going to fail because I come upon a new key like, say, an "&" sign that won't work.

Anyway, came the day and we took off for the Boca, after quizzing the skipper of an adjacent vessel who gave Jim instructions about getting across the Boca (it's very straightforward). One goes up to the junk pile on the beach and cuts across to the inner sand spit all in water enough for a seiner. Jim was happier. Understandably he's nervous about working in waters without a chart, especially ones he doesn't know. It began to

show as he got more and more cautious, and I got more and more anxious to get at it—to begin paying the freight at my end. I knew we had to get on the beach and he knew it was dangerous and scary

We crossed the channel easily enough, cruised up along the inner side where we found a river of water pouring out, going so fast it stirred up great boils of sand up, discoloring the water brown. We tried to land alongside a steep bank and the current was so strong Jim almost couldn't anchor. It was fouled and kept slipping back. The bow swung in against the bank at one point canting the vessel over ominously. Not quite so scary from my viewpoint as from Jim Ruch's (who was leaning against the overhung bow trying to push her off) or Jim Christman's on board. Ultimately we turned down the site for a camp altogether (difficult landing, too far from the channel) and headed across the channel to the south side, where after much hemming and hawing we finally landed at low tide and hauled an enormous pile of gear up the beach to make a camp in the inadequate dunes at the north end. The wind whips right in from the sea, trails of sand snake their way among the dunes, and when the wind falls the mosquitos come in from the adjacent pickleweed marsh. Nonetheless we set up a relatively cheerless camp amidst the impalpable sand, that dusts into everything. We made windbreaks of sorts, anchored tents with deadmen (flat logs set horizontal in the sand), and cooked a meal. Next day we began observations of the whales that paraded by before us.

The new Celestron was set up and proved a jewel. With it we can inspect the markings of whales across the Channel, a mile away, and see birds on the beach a similar distance. It's sharp and clear and lightweight (12 lbs. or so).

We had taken a census of whales coming up the channel, and I'm sure it's a conservative one. There were something over 60 whales. At the point we began to watch behavior, and find, we think, tidal movements. At low tide only a few whales remain in the waters behind the Boca, and they have moved mostly out the channel, we think. Though I guess some must have gone back into the lagoon too, since at the turning of the tide the numbers increase again as the animals pour in from the sea and from up the lagoon toward Lopez Mateos. On our trip up we had the fathometer on and were interested to note deep ripple marks in the channel bottom starting at the shell mounds where both Ken Balcomb and I thought we saw the most frequent breaching inside the lagoon. Deeper in the lagoon the channel bottom is flatter. The ripples go on out into the entrance, where we are told they are quite extreme. A diver, Tim Means, had seen them when he dove in the entrance—a feat by the way that I would not like to attempt. The currents are almost always there.

It rained a little last night, and the tide lapped over the flats almost to the dunes on which our tents sit. Tomorrow I'll transcribe my taped notes on behavior and will likely move my tent down onto the flats behind the main chain of beach dunes. These dunes are a highway for blown sand that flows from one to another when the wind blows, erodes under our tents, fills our teeth, ears, clothes, and souls with drifting sand. On the beach it is so fine it looks almost greasy with glittering magnetite and garnet grit. Enough. Barbara Schevill ministered to a splinter in my foot tonight that she was able to get out much to my relief. I'll be able to walk again. Some illness is in camp. A bit of the eephus, but we think it will pass and we can eat our dehydrated hash browns and canned spinach with gusto. I like the lemons and virotes better, and the glass of sherry at dark. Off to bed in the drifting dust.

February 6, 1978

N. tip of Magdalena Island, at Boca Soledad, Baja California del Sur

1135: Tide is still going out. We have probably 5-6 animals over the central sand bar. On the Lopez side there seem to be a group that have come in that we didn't see before. The ones we watched go out of the channel have indeed gone out and haven't come back. The boats are still out in the channel. They are (the boats) coming in. All whales are down.

1610: We are taking a count. The tide is incoming low. I'll start making a count out in the entrance. We think we see a movement of whales into the area, after having had a dearth of whales during the low tide. They seem to be moving in, interestingly enough, from both directions. There's a blow out as far out in the channel as I can see (1), in the Boca Soledad channel before it turns south. Another blow (2) from an adult; it appears to be a big blow. The wind is high—25 knots and blowing sand. Partly cloudy skies. You can see the incoming tidal current. One more possible blow out in the channel (3). Tosscaps out in the channel sending their plumes up into the air. Another blow just at the entrance to the Boca Channel (4), a large one. No babies were seen. Very large whale threw its flukes just at the point of land at the end of north island (5) Both of the last two appeared to be coming in. Tursiops right abeam of camp. Cow and calf abeam of camp, just below the bluffs on the far side of the channel (6,7). Cow and calf on this side of channel (8,9), momma with great white snoot. Mother is throwing her head up periodically. Another off the cusp of the central bar (10), I have not seen a young with it. Central bar a blow (11); I can't make out whether there are one or two. Cow and calf this side of central bar (12,13), on the Lopez Mateos side heading toward the boca. Pitch-polling adult off pelican bar (14), next to median bar, two adults off little mangrove island across from camp (15,16) pitch-polling animal at base of bar (17), two adults and calf (18-20), Lopez Mateos side across from camp. Third cow and calf (21-22), all moving toward central bar. Five more whales back toward Lopez Mateos (23-27) apparently all moving toward the boca. At least into the embayment in back of the Boca. The time is 1630 at the end of count.

February 7, 1978

N. end of Magdalena Island, at Boca Soledad, Baja California del Sur

What a night!! It blew and blew and blew. The sand whipped along the dunes in a continual stream, insinuating itself into every crevice of everything. It piled over boxes in our little food tent, it came in the flaps on both sides of the tent, it gummed up my typewriter to such an extent that I thought it would never work again on this trip. The tide didn't quite make it over the crest, but came very close—lapping amongst the guardian dunes but sinking in and then receding again. We all awoke gritty and without any official word began to move camp down behind the dunes onto some flats that seem relatively safe from the tide. That remains to be demonstrated however. It took half a day to get everything moved, deadmen buried in the sand platforms leveled, tents moved, water barrels rolled down, and so forth. Barbara's tent was the last moved and we simply picked it up bodily, tent poles in place and walked to the new site (after, of course, moving the tents separately). All folks were in good spirits in spite of discomforts. Barbara and Sandy went for hikes today and came back with cockles and hachas (*Pinna*)

from the little local marsh. The *Naia* came in to check on us. She had made her census. I guess she'll be with us tomorrow at low tide for a new task and to unload people and maybe a bottle of gin to keep our spirits up.

I had a nice walk with Bill Rogers out around the point, looking to see if we could see whales in the channel outside (we couldn't), but we did pick up some lovely shells (the beach is peppered with them—mostly pelycypods of various sorts). Bill is a fine enjoyable companion and a dedicated naturalist. I think he is bound to go far in his field.

We cooked the shellfish and a great pot of beans and I tried a little surf fishing (unsuccessful) and then notes.

[Drawn Map—place names at Boca Soledad]

February 8, 1978

N. end of Magdalena Island, at Boca Soledad, Baja California del Sur

I'm sitting in my gently flapping tent after taking the high tide count in the Boca area. The sky is clear, pale blue and blown with what the Hawaiians call ehukai, or the mist of blown sea spray. Our count was, we estimated, as much as 30% low because we could not easily spot animals in the outer channel and the blows of babies tend to get lost, as do adults in the distance. The high tide brought sea swell crashing across the water bars all but obliterating the outer channel in breakers and tosscaps. On our dune where we stand to watch the sand snake by our feet in wavering sheets that coursed down the low places toward camp, making us careful not to shuffle our feet too much. In front of us the tidal flat swells at first, from a kind of low channel at the dune bases and then slants off to the channel 200 yards away. Now, with the tide high, some waves driven by the wind coursed up over it and sent a mass of pinkish foam (likened by Bill Rogers to the froth on the top of an A&W rootbeer float that is going flat) down amongst the sparse dune vegetation. Semipalmated plovers and sandpipers dipped and dabbled in it. We watched anxiously to see if the barrier to our tents might be breached and water enter camp, which is lower than the beach places. Insidiously, the water appeared not over the dune barrier, but from the south, up from the little lagoon where Sandy had located the hachas last night. But, so far, it has stopped some 400 yards away, sinking into the dampish sand, filling burrows. I set the main tent complex on a platform of sand I shoveled out from a dune, so my tent, the cook tent, and lean-to are up a foot or so above the low places. Only Bill, really, is in a true hollow, with his weird nudibranchish tent. I never saw such a creation. It is green and yellow with various cylindrical air vents, a wide open mouth, and a big high hump in the middle (where, I think, one stands up inside). We'll see. At any rate our NW wind isn't over yet. The *Naia* came up to check on us and we found that our walkie talkie is pretty much line of sight. They went off back down the channel, avoiding the swells.

In the afternoon low tide the *Naia* returned bringing the crew from the run down to Colina Coyote (Bill Schevill, Jim Ruch, Bernardo). They had made two counts and the largest was just over 100 pairs, plus a very few singles. They also obtained a complete fathometer trace along the channel. Bill Rogers and I jumped aboard since tomorrow we planned to observe at the second shell mound, where Ken Balcomb felt that an unusual amount of breaching occurred. Jim took us down to the little anchorage just south of Lopez Mateos where we tied up in the calm. There was enough wind chop that the boat banged loudly on the water, it being a resonance box down below. I slept in the forepeak

and hence was treated to the best chorus of gurgles, clicks, booms, and bangs. It kept me awake for quite a while, but finally I drifted off.

February 9, 1978

N. end of Magdalena Island, at Boca Soledad, Baja California del Sur

The morning was spent gassing the *Naia*, which consisted of hauling our 15-gallon drums to the local Pemex distributor, who features a shed with drums, a big plastic siphon hose, and a small boy adept at sucking without getting a snoot full. We carried our gas across the deck of a seiner to hold it up and sluice it into the funnel and thence the tank. Jim regulated the flow with his hand while I held up the barrel. The work got easier as the level dropped. We also picked up food and beer, and the about 1PM took off for the second shell mound south of Lopez. Bill and I put ashore while Jim took the *Naia* away to prevent disturbance. We were then treated to a procession of animals going by in the tide that must have included a fair part of the entire central channel population. Almost all went by from deep in the channel toward Lopez with the tide. Later, a few seemed to swim against it but in actuality were entering an eddy across the channel from us. They did not persist in swimming against the current but stayed in the eddy area, which came known as the pitch-pole place, because we so frequently noted animals pitch-poling out (what I used to call "spying out" but Bill Schevill tells me the whalers called it pitch-poling, so why not use the old term?). In this behavior the animal levers itself up slowly out of the water, its tail almost certainly on the bottom, and then subsides back, or falls slowly over. At any rate we watched from near high water to just about slack low tide. One gets the impression of the entire population in flux with the tide, sluicing back and forth in the channel according to the tide, sometimes swimming, with or against the current, and sometimes simply drifting. Often we could see the huge bulk of the animal only as a long low line of whale, which when viewed end-on showed the very broad arcing back of the floating whale. The little calves bounced around the mothers, often sliding over heads or tails, and sometimes taking little sorties away from the dam, only to return moments later.

Back at the camp we found the Ruchs had been out in the lagoon to the south of the mangrove patch near camp. Sandy, who is an excellent predator, had located both hachas and cockles in abundance. They came back with a great bag of the former (*Pinna*) and Jim set about preparing just the big adductor muscle. They have a lot of parasites in the guts, which thus is the most unappetizing part of the beast. So, just muscle. We also caught some good fish (sand bass and yellowfin croaker) which I prepared. We got the good cooking oil smoking hot, William made up a batter of eggs, bisquick, and beer, salt, and water. I dipped my fish in just flour and he dipped the hachas in his batter. Both were exquisite, I thought, and we ate until we burped in delight. Wow, what a feed. The vegetables came last and were cast into a shadow. So, off to bed, replete, with a good day's observations and a magnificent camp meal under our belts.

February 10, 1978

N. end of Magdalena Island, at Boca Soledad, Baja California del Sur

Today Bill, William and I wanted to work the outer channels, to see, if we could, what the whales do there. I lay in my cot, in the calm morning, listening to the clicking pots, the low conversation, smelling the wafting smell of coffee cooking, and finally

bestirred myself for a little breakfast—fried eggs, toasted virotes with ham, and such. Friend Barbara was at the helm, and a steady hand she is. She's such a good soul in camp, so uncomplaining about anything, so capable. She, Bill, and Bernardo will go off today to look at the whales at the shell mound, to see if they can see the pitch-poling whales that we saw. Only this time they will be on the dune side, nearest the whales.

They boarded the *Naia* through a little surf and succeeded in getting wet, but I gather not seriously so. Off they went, around the mangrove bend, not to be seen until later in the day. I spent an hour talking to Jim Ruch, about the Washington scene, should I be on the Commission. He knows a lot, having been an assistant to Nat Reed in USFWS. Then I trudged off after William and Bill Rogers, who had gone on ahead to set up a watching post at the Tent Dune. I found them perched up on top a bigger dune, William leaning back on a fine backrest board buried in the sand, Bill watching from the standing position. They hadn't seen anything in the inner channels, but had been watching whales outside the surf; they all went north. I relieved them and they went back to camp while I watched. I soon located two channels, one nearest the beach that I expected, but which did not prove to be the major channel, and a farther, almost-at-the-edge-of-vision channel, that bore most of the whales. I saw several and tracked some as the tide receded and the whales sluiced out of the lagoon and into the open sea. I was alone, on that island tip—nothing but sky with scudding clouds, symmetrical dunes, all swept clean by the wind, a broad expanse of beach in front, a gaggle of pelicans, royal terns, a few gulls, and some smaller birds. Beyond the tiers of breakers and channels intervening the sea could be seen, pale with sardine seiners pressing their proud way through the waters at their bows, the masts forking above and the stern down. Loaded with fish? I didn't know. Maybe. It's a long way to the cannery and the fish might be rotten ere they arrive.

In the farthest channel I watched a trio of whales drift out toward the entrance. It took half an hour or more as they drifted with the tide, blowing, pitch-poling, and spouting. One animal, in particular, bobbed frequently, passed along the channel, and finally with the current, I presume, turned north out what I had not earlier perceived as the entrance, but what I think was it. It was a low place in the last breaker chain and the animals simply bobbed and slipped out it to the north. My bobbing animal poked its snout up as it bobbed over the thin breakers into the open sea. If the channel I perceived is correct it runs out along the shore of north island, turns southward in a broad arch, and then when close to the outer breaker line turns rather abruptly north.

Bill and William relieved me and I trudged back across the broad shiny sand beach dotted with shells, the blue sea beyond and the tiers of parallel rows of breakers beyond. Bluffs of eroding sand to my right rising to clear dunes accompanied me as I walked along. Back at camp Jim Ruch and I rigged our poles and went fishing down by the mangroves, netting several sand bass (*Paralabrax nebulifer*) and a yellowfin croaker. Later we cooked these up in William's special batter along with some wonderful spaghetti and clams. After dinner Bernardo told us about the Mexican government and its role in wildlife management. He told us of the lack of understanding in the elected officials about wildlife problems, the problems of the ejidos and the land ownership. He then told us the almost heroic story of his becoming a mammalogist, and then the Secretario de Fauna Silvestre, and how he built up the collection and department at the Universidad de Mexico. He has risen from a barefoot country boy to a level next to the

President of Mexico and a person considered for the Presidency of University branches and yet he is a joyous and simple person, full of fun and pride in his country and his people. I look upon him with deep fondness and admiration. I watched Bill Rogers over on the sand dune by the fire soaking it all up, a real experience for him as he later told me. Bernardo addressed much of his commentary to Barbara, whom he had met years ago as mammalogists, and for whom he has such respect. Quite an evening, graced I might add by Jim Ruch slipping by my tent with a cup full 1/3 of good scotch. Hit the spot as I sit here typing.

The wind comes in from the SW now, for some reason, with a low [?] of broke clouds—hope it doesn't portend rain, but it seems clear.

Bill Schevill, Barbara, and Bernardo spent the day down the channel at the shell mound and did not see the pitch-poling play we had noted the day before. They did, however, have a good time observing.

February 11, 1978

N. end of Magdalena Island, at Boca Soledad, Baja California del Sur

Well, it did indeed portend rain. Not long after I turned off the Coleman the tapping on the canvas started. I lay there listening to it, trying to recall if anything sensitive had been left out that I should get up for. Then I heard an interior dripping, fumbled around and found a light and found the tent leaking badly from a dozen places, especially over the foot of my bed. By the time I got around to doing anything significant my bag was soaked up to about my knees. A pool of water was growing down along the front door. I wondered about the rest, especially Jim and Sandy in the abominable pop tent. But it was Bernardo and William who got wettest, and Bill and Barbara who had a lake on their floor. Not much to be done, except for everyone to fend for themselves as best they could. It blew so hard the tent bellied in like a sail in a gale but I slid back into the sleeping bag and finally drifted off, listening to the periodic sheets of rain that hit the tent. By morning it was pretty much over. Jim Christman came in early and took us out for the morning to see if we could get up on a pair of whales nursing, or mating, or whatever. The best we could do was to get close to whales who knew we were there. We saw one quasimoto style whale with a bent tail, a hump, and a very shortened body from knuckles to flukes. It seemed to go along OK, and was a smallish adult, so obviously it was on its own and surviving, and even migrating.

The channel was rough with wind and finally about 1:30 PM we landed again through the surf and went back to camp. Not long after our arrival a black wall of cloud swept in from the southwest and we all grabbed our drying bags and clothes and headed for various tent interiors. It hit as a gale, so hard I had to grab the front tent flap and hold on to keep it from slatting to pieces. The water came in again, but this time I was more ready for it and was able to keep most things dry. Having an uneven tent floor set on dune sand helps.

It went away after a while and William Forment and I went fishing, and I had the joy of watching him catch almost his first fishes—a couple of nice little sand bass. “Hijos, they're bigting,” he cried so loudly that Jim heard us over the mangrove in the adjacent lagoon. I had a nice time talking to him to see what he could find out about the gray whales of Sonora-Sinaloa as a project (he wants to work on whales).

Jim Ruch and Sandy went hacha hunting again, and came in with 12 big ones. One cracks a hole in the side at about the middle and can then reach in to slice the big adductor muscle and the shells fall open. There are two bits of muscle—the adductor which may be nearly 3 in. across, and two smaller slips that run longitudinally into the body mass. Quite a meaty beast, and delicious. Fish done in William's batter is delicious too. Our third meal in a row.

After dinner we had a few songs featuring me and Jim, a bit of memory teasing by Bill Rogers and droll comments as always by Bill Schevill, who never seems to forget anything of that nature, and who always has the viewpoint to see such things as they come along.

We are running out of useful things to do here and I think we will begin a phased withdrawal tomorrow. Jim Ruch and Sandy will leave on Monday, and we will be in La Paz on Tuesday, I'd guess. The weather has been pretty tough on us, but we have learned some new things of use, though not by any means all we had hoped we would. That remains at Punta Rehusa, and can best be reached by small boat from Puerto Chale, across Almejas Bay.

The wind whistles, especially in the tent poles of Bernardo and William and flaps my tent as it moans by. One wonders when it will come in carrying rain. It has shifted from SW to NW now, and may simply blow again. We won't be buried in dune sand this time, anyway, and I don't think the tide will wet us.

February 12, 1978

N. end of Magdalena Island, at Boca Soledad, Baja California del Sur

Nice calm day today. The Ruchs left to go look at their house at La Ribera. All of us enjoyed having them with us. Sandy is a kind of peppery little girl who had to get us all out to see her black cloud, but also stood for no garden sass from her Jim, who is nothing if not positive. He is a very bright, thoughtful person, dedicated to action, but in a political vein that is there are limits on what one can do, and learn to maximize the opportunities. A magnificent civil servant I believe, and a helluva nice guy. He and Sandy went with Jim and had a bottle of tequila with him. He came in the next morning a bit droopy but still with it. I typed on my plan for a field station, washed clothes, and spent a lot of time looking at whales. There were a number of old friends here, though not all of them by any means.

February 13, 1978

N. end of Magdalena Island, at Boca Soledad, Baja California del Sur

Today was kind of goofing-off day. I didn't think there was a lot we could do very productively here and thus spent my day leisurely writing on my Center for Field Studies proposal, and then washing shells, tidying up lines, and finally in a long, leisurely walk around the mangrove lagoon, and a fish to make fish chowder for dinner.

The day was calm at first and then the afternoon breeze came, sliding the dune sand in sheets over the dunes and into the channel across the beach. But in the evening the wind dropped a bit and it is breezy at this juncture.

We stayed here rather than leave a day early because nobody had hotel reservations and it is much more expensive in town than here. It was nice to have a slow motion day before the onslaught of packing, which begins tomorrow. We will try to take

out as much sand as possible, but it's in everything, especially this typewriter. I have no idea how it manages to function and will bet I get half a teacup full of sand when I clean it at home. I put the delicate gear on the boat today—cameras, night vision scope, etc.

The lagoon is a lovely one—banked with mangroves at two sides and sand dunes on the others, some spilling right into it. In the flats one could find dozens of scallops just for the picking, and I used a few for bait, to catch a mojarra, a puffer, and to lure a guitar fish up close. Lisas jumped often and I suspect ladyfish too, and I saw a couple of 8-lb. diamond rays cruising along. Across the water were rafts of brandts, scaups, and mergansers, as well as some egrets and others. Beyond, over the bar the main channel shone blue, with cruising whales blowing as they drifted by. Bernardo was there trying to master his boat pole, which has a standard old star drag reel. He is trying to cast with it. Later I gave him a little lesson, but it's not built for the task and the most he can expect is 50 ft. or so. I caught a half a dozen sand bass and one cabrilla (*Mycteroperca pardalis*) to make a casuela for dinner. Barbara cooked the vegetables and I supplied the fish. It was good, especially with a garnish of jalapenos.

So ends the effective time of the trip. I hope Bill Rogers comes out with a dissertation topic. I'm happy enough to turn over my work to him, and to sick him on Punta Tosca later for a real view of whale goings on outside the entrances.

Wonderful company this trip—though the weather has been tough and we didn't get to work where I wanted us to go. I think we've learned a good deal, but more awaits us, and more is needed. I truly don't know if we can hope to demonstrate much that will be convincing evidence for or against the necessity of lagoons.

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Granite Mountains: April 8-10, 1978

April 8, 1978

Bunny Club, Granite Mts., San Bernardino Co.

Well, the Granite survey crew is here. They've vacated the cabin for us and moved down to Cove Sprig, where they had tents and the trailer all set up, plus the series of tents needed to accommodate 11 people. I spent a time with them trying to assuage their concerns about not having enough original work to do and what sort of collections to make. I tell them, "No worry, really." Just do what you can, to the best of your ability and the rest will care for itself. All in all they have really no problem—just do the best they can. They're so good, so bright, and so eager, and so special.

This day was spent with observation groups, three of them, all focused on the single male Anna's hummingbird. It sat on its snag of catsclaw, flying off to meet imaginary foes, or birds passing over hoping no one would rise to challenge them. But our hero rose up—vertically to challenge the intruder. Off they went in a wild arabesque over the swell of the hills, out of sight over the [?] creosotes and were gone.

I think the little bird was guarding his territory—perhaps five catsclaws—from all others, especially other hummers. Those he drove off violently, in long, low chases across the alluvial fans. Sometimes he would be gone for minutes on end. Sometimes we could see him rocket off and up and over the granite monoliths to disappear altogether in the sky. I wondered how he stayed warm, what ran his engine, what passions motivated

his breast. Who knows? I suspect that passion digs deep in history, far back in the dim recesses of time, into those early creatures that we scarce allow to be mammals, those nearly or wholly reptile. I don't see these things in reptiles. They seem mute and without essential emotion to me. What is it that governs their lives? A basic, unembellished urge it seems to me. The drives are there but the complexities of emotion are only alluded to. Even in lower mammals the skein is incomplete. Do they care, do they suffer deep pain, what is it that they feel? Somewhere the complexity rises. Is the sentient being an excrescence that uses essential talents for purposes that have little survival value? Who cares that an animal should care? And who does?

I guess that continuity will prevail and that a gradual change from the mechanism of lower reptiles to the choice-prone emotional life of higher creatures will be the rule, increment by increment. It's a source of wonder to me that people can expect otherwise.

April 9, 1978

Bunny Club, Granite Mts.

Today was dune day plus quite a lot more. We started our day with talks in the cabin. It was cold and bluster outside with a mist rain falling. I wondered that no snow had fallen on us but it was close as the upper peaks of the Providences, which were dusted with white.

The rain continued and even came harder as we drove over Granite Pass and down toward the Kelso Dunes all veiled with rain. One could hardly see the main mass of the Granites in its cloud.

Parker was at the magnetite mine and directed us outside his cable gate. He didn't recognize me, I believe. I understand he is making conciliating noises toward us now that our purchase is essentially complete. I welcome that. The mine machinery is freshly painted and the operation has a look of activity about it, though we saw no collection operation in action. It seems pretty clear to me that it is a stock come-on.

Up the dune we went and as we did so it cleared, and before the top was reached it was clear and calm. The sand was wet enough that our footprints dug steps up the knife edge of the dune, making it vastly easier to climb than in shifting dry sand. But, in compensation, the dune wouldn't sing for us—why does water make dune sand hard? I'd guess it has to do with the summation of the capillary forces that cause water to cling to surfaces. Around each grain these must exist, and when grains touch each other the sand might be tied to each other, and in aggregate the sand becomes hard enough to walk on.

Personalities emerge. The group is intent, responsible, eager to learn and experience, as yet a bit reticent, but that will come. Larry streaked the dunes coming down 100 yards away in the buff amid commentary about ogling at him. I guess he was loosening up the group. I didn't ask.

Louis is full of humor and we swap tales about San Fernando Valley. Susan is as bright and accomplished as I thought. Walter loves his music, builds his mandolins himself, and plays up a storm. Randy is a live wire. Mark Thomas brims with energy and goodwill, and so forth. All work with dedication. Couldn't ask for more.

At the top Charise gives a nice talk on dune origins which I adumbrate. Then we slide back down on the hard sand.

At the bottom we find Mark with a *Callisaurus*, which is a good topic for conversation. the bajada floor is a garden, beautiful flowering plants broadcast across the

washes and dune aprons. There are lovely large white *Oenothera deltoides*, *Abronia*, a great display of *Rumex hymenosepalus*, whose leaves, I find, are colder even than cool air. No umas are caught though I see occasional tracks.

We stack our food boxes on the road by the bus, slice cheese, break out the fruit and bread, lettuces, mayonnaise, and mustard on a fender and have at it. We were all hungry so a lot of provisions disappeared.

Then, tumbling back in the bus and calling for buddies (we divide the class into trios who watch for each other) and we are off toward Civia and Cedar Canyon. I took an observation group out on the hill below Hole in the Wall to talk about observations. we descended by rings set in the rock to a level below the camp—out on a magnificent bajada bounded by battlements of vertical volcanic ash cliffs all shot full of solution caverns. We saw a pair of nesting redtails, a beehive, and swifts rocketing by. Once again everything was verdant and moist from recent rains.

April 10, 1978

Bunny Club, Granite Mts.

Toda was individual observation day and our crew scattered like a covey of quail. They're a responsible lot, thank goodness, and wrote down their plans in the flight plan log. At the end of the day as the shadows stretched out across the east bajada, one group of five gals hadn't come in. We checked the log and found they had hiked around the toe of the Granites toward Snake Spring. I knew the hike and knew it is long and over swells and arroyos and congested boulder piles. So Larry and I went down to the camp of the Granite Survey crew at Cove Spring, borrowed a vehicle, and drove off down toward Granite Pass. There they were hiking up the road looking tired. We gave them a lift to the cabin and I had that glorious relieved feeling when all the chickens are in and safe. On this first trip one is never sure about people until a little experience builds up. Looks fine so far, and I know a lot of the folks well enough to feel comfortable.

As for me, I took a nap on the porch and dropped off in deep sleep quickly. I don't know, maybe I slept an hour with the balmy spring air wafting over me. How delicious!

Big River: April 23-26, 1978

April 23, 1978

Jim McMillan's Yard, Mendocino County

At 7AM the vans awaited us at the Barn Theatre, and then followed a bout of canoe tying and gear loading. Not long though, as everyone was quick about it and were off up Hwy 1. Larry detoured to Berkeley to pick up Dave Hart and to buy me a shelter.

We met at Audubon Ranch at Bodega Bay where everyone took the hike up to see the nesting common egrets and great blue herons. The treetops were covered with them but on the top of every tree trunk was a heron nest. No egrets occupied these much larger nests for some reason.

After lunch we drove up through Olema, along the trace of the San Andreas. I wasn't feeling too well and slept much of the way. Not much rest before leaving, I'm afraid. Larry gave me a very nice note from Craig Schindler thanking me for being

constant on his behalf. I have been and hope that lugubrious appointment matter is settled soon. It was part of my tiredness I'm afraid. I doubt that I'm really cut out to be a bureaucrat, especially when great dollops of inhumanity intervene. Oh well, it may come out OK. I feel confident it will.

About dusk we pulled into Jim McMillan's yard and were greeted by the boys and led through the driveway via nearby trails because it was a quagmire. The sky threatened so I chose to sleep in Jim's school, along with most others. It's a marvelous, idiosyncratic wood building all full of lofts, angles, little triangular windows, with Jim's pot farm growing upstairs and corners crammed with kilns and other projects.

We had dinner around a great, blazing campfire in Jim's newly cleared meadow. Dinner was cooked there and then we listened to a fine discussion of the pygmy forest by Louis and Teresa. Then Jim and John Paul led us on a tour of the pygmy forest about 100 yards away. There were clumps of bear grass in bloom (*Xerophyllum tenax*), their candles shining white in the flashlight beams, Ft. Bragg manzanita (a very small-leaved low shrub), and a larger more bushy one. Salal is everywhere.

Later we retired under gloom skies but no rain.

April 24, 1978

Big River, Mendocino County

Not for long, however, as after breakfast and by the time we'd reached Mendocino Woodlands it was drizzling steadily. Gear was stashed in a great pile under the old, battered, yellow tarp while we waited for everything to arrive. I spent my time loading all the food and camp gear in one skiff preparatory to launching. After a while we were off with quite a few people walking down the logging road to the crossing only 1,000 yards downstream.

Soon we were all there, the rain still coming down. Much scurrying around and tents went up under the redwoods on a flat 12 ft. up from the river level. The cooking shelter was a grand one, located on the top of the sand bar and covered by the big tarp. All stoves and similar paraphernalia were on benches in the sloping sandbank, scraped by hand. The guitars and mandolins came out (Walter is a real mandolin picker), dinner was cooked, eaten, and reports given. Then we wended our way to various shelters.

Jim's (McMillan) collapsed during the night sluicing water all over them.

There's a stomach problem going around, involving diarrhea and I've got it mildly. Some folks are really sick like Lisa and Dennis. Before long everyone had sampled it. Fortunately it seems to last only a day but it's fairly miserable for some folks, what with the rain and all.

April 24, 1978

Lilly's, Big River, Mendocino Co.

We divided into two groups—one of which I was leader, headed for Laguna Creek marsh, a 3-mile walk through a newly timbered redwood bottomland forest. Even though it was selectively cut the devastation was great. The other, led by Dave Hart, went off to look at stream and stream margin insects. They went off upstream all jingling with vials, nets, and bottles.

Our walk took us through the slash with lovely spindly trees standing up with just tufts of green at what had once been forest canopy level. Many had fallen, sprawled

across the littered forest floor after their equilibrium had been broken by the removal of surrounding trees. Those that were left swayed in circles, the dampening effect of adjacent foliage having gone and the wind now pushed them with its full force. Many more may fall, even though no logger touches them.

We could see the clay bands at the base of standing trees that told how high the flood waters had reached in Dec. 1964. On some it was 15 ft. above the ground and the whole valley must have been flooded.

Part of our crew went in a canoe. They were fortunate enough to come upon a pair of wood ducks cruising in the river and later, a pygmy owl setting on a low branch in a tree.

The marsh extends a mile up a south-branching fork of Big River and is the result of what appears to be a silt dam at the canyon mouth. It is choked with cattails (*Typha*) and with lilies (*Nuphar*). We found evidence of beavers—a dam, all patted with soft mud, a run with footprints here and there where the mud was soft, and a place where they entered the water under a log.

Seining didn't produce much, but the dip and zooplankton nets paid off with lots of small things. There were water fleas, whirlygig beetles, striders, *Daphnea*, and Charise had a leech latch on to her leg. It filled itself amazingly rapidly, and only when she pulled it off did it stop and then it pulsed red with her blood.

Back at camp the rain lessened and finally stopped. Dinner was begun, reports given. Dave's group had located a lot of streamside insects and a few things from the water. We all milled around looking at the collections. Mark Brown came in with a gilled Dicamptodon which he had caught in a nearby pool. Our group had located two species of *Taricha* (*granulosa* and *rivularis*) walking on a forest trail. I was surprised at how distinct they were. The *T. rivularis* was much longer and smoother with bulging eyes than the *T. granulosa*.

Someone noticed that we cast huge sharp shadows against the far bank and its trees, in the light of the Colemans. Kathryn said she always wanted to be a monster and so she was one—80 feet tall. By standing 10 ft. apart and fencing, death defying sword play occurred. Others pounded each other's shadows into the sand. Maidens were hauled off by King Kong and so forth. Finally, off to bed out of breath. No more rain but the dysentery and colds hang on.

April 25, 1978

7-mile Camp, Big River, Mendocino Co.

We loaded, sent a bucksaw team downstream to cut channels through some fallen alders and finally landed. Several folks went by car around and hiked up from below to aid the weight problem. I took the aluminum gear skiff this time accompanied by Kathryn who had never been on a river before. We sluice along, rowing to avoid snags in the olive water. Once we hung broadside on a snag but soon were off again without getting near to upsetting. On down the welling river between walls of alders, willows, firs, and redwoods. The current gradually slowed as we reached tide water and finally I began to row steadily. The last couple of miles was all rowing. We pulled up to the sandbank and most others were there arranging their gear or thinking about cooking. With half a day left we let people paddle—took the disadvantaged folks who had to hike upstream with the motor, which I got to run finally with starting fluid. Jim and Larry managed to get

them way upstream but broke a stem pin in the procees. So we had to go to town. Mark Brown and I said we'd meet them in the skiff, so together we rowed all the way, as did Priscilla Pattison, in a dinghy.

Soon enough they arrived with some rod for shear pins and we made the traverse up without a hitch. By that time darkness had set in and so it was dinner, reports, a bit of music, and to bed.

April 26, 1978

Home

Well, we sent everyone out for the morning. Most rowed on the river. I loaded my boat with gear and we did the same for Jim's big wherry. Nearly everything fit in and not long later we were off by outboard, towing the wherry. At the entrance we crammed the gear in one of the vans and set off upstream. Dave Hart and I stopped off at a pickleweed flat to see if the brine flies and spiders were still performing. They weren't. But it was interesting anyway. Two alligator lizards crawled along the bank of one catching some sort of insects and swam out to a big algal raft. We watched corexid beetles (whirlygigs) diving up and down and occasionally popping out of the surface, spreading their wings and flying away.

Jim talked to us about his trials in trying to save the estuary, a hokey pokey, and we were off. Lots of singing, dancing in the Cloverdale park (Walter lost his wallet and got it back later—cheers), a Chinese dinner in Berkeley.

The trip was interesting and aside from the rain and dysentery, fairly comfortable, but the information content was down and logistics up somehow. Both Larry and I spent most of the time planning, packing, worrying about who was sick and where folks were who didn't sign out. Kevin discovered a hewn tree on one of these unpublished jaunts (for which I chided him) back of 7-mile camp, on the north. I'm not sure about it. Jim's presence was a diversion. I'm not sure we needed that as it seemed to keep the group a little way apart somehow. I'll be glad when we are by ourselves at Villa Creek.

Villa Creek, Monterey County: May 5-6, 1978

May 5, 1978

Villa Creek, Monterey County, California

Another of my patented hectic starts. I had a meeting with the chancellor on a painful personnel matter in the board and then met Deni, who had a rather badly sprained ankle, Mark Thomas, and Mark Brown for the drive down. I had assembled the parts of a sedan chair to haul Deni up to Upper Cruickshank camp, but we had to buy two poles. This we did, and then drove off down the coast. It was a clear, blustery day, the ocean flecked with white and marked by tumbling breakers along the shore and great swirling boils of white water over the offshore stacks. The spring and winter rains had left the Santa Lucias clothed in green, while flowers of various sorts flecked the slopes with color—lavender hedge nettles, poppies, ranked sage bushes of white and blue, lupines, and much more. Skies were clear and bid fair to stay that way during the trip.

Dr. VanDenburgh put in a brief but heartening appearance as we were heading for the hardware store to buy poles. He was a dumpy little hobbit with his big belly sticking

out, a green t-shirt under an old reddish jacket, union army hat, and a fine tangled whitish beard. Green—that was the important thing!

Anyway, at the trailhead we met Larry, all alone, to help with Deni. I rigged up the sedan chair—an aluminum folding chair strung by nylon rope with two poles, padded for the shoulders with part of one of my old insolite pads.

Off we went, 120 lb. Deni riding nicely between us. We crossed the road as a motorcyclist buzzed by, turning his head in curiosity to see what it was that started up the trail. The first of the trail is a series of switchbacks that climb a very steep, soft chaparral-covered slope. My, was that a job! I finally relinquished my position to Larry about $\frac{3}{4}$ way up and stopped puffing and panting, my legs aching in oxygen deficit. I had my doubts that we could do it at all and then reflected about what we would do with Deni—she couldn't walk, and we couldn't leave her. Then I put on my gray heavy pack (extra laden with the gear of some of my colleagues) and realized that it was no better. I had made the hike before, heavily laden, so we would make it. On up we went. The poles make turns difficult, like the rear of a hook and ladder truck. Finally, my second wind began to come and the trail gradient eased as we trudged around the north shoulder and into Villa Creek Canyon. The hills were splashed with flowers and mats of wild strawberries in fruit. The poison oak, too, was lush. Long shoots with glossy green leaves ran across the trail in many places and while steering the sedan chair (the Big Sur Swaymobile) it was impossible for either Deni or the wogs driving the Swaymobile to avoid. Deni began to behave in a queenly fashion, urging us on to get to Cruickshank by tea time, and “would we move a little more smoothly so she shouldn't sway so much”—all in jest.

We finally emerged at Cruickshank to the clatter of pans and beating of plates in welcome.

Not much time left before dark but I set my pack down under the oaks up in the meadow and hied it for the creek and a wash. I sloshed my pants in the creek, soaped them, and then went fishing—not long before I had a nice 11-in. trout and one smaller one—enough for dinner. I cooked them, ate my dinner, had a nice set of reports on aboriginal history. Lisa's was a fine one.

Then, off to bed under the oaks, aching but happy. Owls hooted and some other night bird made its call.

May 6, 1978

Villa Creek, Monterey County

Well, today is niche day. Some folks had their act together early and went off up the trail. These were the Santa Lucia fir group. . . .

We've come to this mountain and together we've begun to perceive the almost overwhelming intricacy and variety of the natural life here. We see that every living thing has a story of how it makes its livelihood, how it reproduces, how it interacts with the life and the physical world around it, or even how it interacts with other life within it—for the surface we call our skin, or the feathers of a bird, or scales of a lizard, are the most transgressible of boundaries in both directions.

We see that time, the incoming energy stream from the sun, levels mountains, the sea floor itself moves, jostling continents like the pieces of a jigsaw puzzle, that streams

have life and that they somehow sustain those living things they ceaselessly wash toward the sea. We see that fire is as much a part of life as water. We begin to see that while questioning about the life on the mountain can often be done quickly, proving this or that about it, is much slower.

We have begun to tell stories, to weave relationships, to pose questions, but we are only halfway there because nature gives up her secrets grudgingly. A fact may be the most precious of commodities.

We begin to perceive that wresting these facts from her starts with a question and a test, and another question, and on and on, the wheel turns until our hypothesis, insofar as we can see, fits, and we are then halfway. Then comes the counting, the measuring, the pondering about what we *really* know.

And us! With our ripstop nylon, our osprey glasses, our Svea stoves that must be cuddled like an infant before their internal store of diatom digestate wells forth to cook our meal. Where do we fit? Why should we care? Doesn't the world always change? Are we part of this mountain? I'm sure we all have come to regard the lives and processes here and in other places like it as a central part of our being. To see them molested, scraped away by a D-9 blade, or forced to cope with foreign chemical sprays is saddening, even maddening, to see it die cuts like a knife.

I see a paradox. We grasp for contact with this world and engagement in it, but in many ways we fit incompletely and see incompletely. On a larger scale the rules of our world are no different. It is our power that is the problem and our understanding.

Tuolumne River: May 12-15, 1978

May 12, 1978

Tuolumne River below Hetch Hetchy (above Early Intake), Tuolumne County

The old blue bus picked us up at the Barn Theatre at 6AM. I had rather little sleep the night before and was recovering from the effects of a GI exam (Barium) which followed three days on liquids. All that left me weak so I was in bliss on the tarp, my head against a bedroll and a groundcloth over me to ward off the chill. I slept clear to Merced. We made our usual circuit into Yosemite and had the usual trouble rounding people up. I don't know why I let them talk me into that nearly meaningless jaunt composed of gift shops and grocery stores. If it weren't for the magnificent falls and rock faces and the nice indian museum I'd check it off altogether.

Then on up through Mather we went, cutting back to Early Intake. Quickly enough I shouldered my pack, with shears in hand, started off. Ted and I set about chipping away the poison oak.

The day was rather warm and clear. Winter rains had brought up a fine, diverse wildflower show. I stopped at the Big Pool camp and instantly later, with much whooping and hollerin', $\frac{3}{4}$ of the class was in the creek. Larry and I hadn't planned anything except a report or two and it was getting close to dusk so I just turned people loose and went off to set up my camp, which Larry and I shared. We were right where Annie Gottlieb and Don had camped the year before.

After dinner Walter and Larry and Teresa and I sang on and on till nearly midnight. Off to bed, the mosquitos having mercifully long since gone to bed.

May 13, 1978

Ponderosa Beach Grove, Tuolumne River

First thing this morning we dipped in the great rocky gorge pool, its black water rippling in silver and the walls echoing with joyous cries and splashes. It's a nice sunshiny day, bordering on the hot, glorious weather for a camp. I clipped poison oak branches from across the trail, mostly for Betsy who is so susceptible. It's a lovely hike up the canyon. The trail clambers up the great blocks of granite shed from the canyon walls to form a scree pile that sometimes chokes against the river and sometimes retreats up against the flanks of the canyon leaving grassy meadows undulating down to the alder and willow-bordered stream. In these meadows the footpath led between grasses and lupines in flower, and across occasional little crystal streams winding between banks of black soil and rushes, banked often enough by yellow streamside *Mimulus*.

Up on the rocky stretches birdsfoot ferns sprang from under boulders and more verdant succulent species such as wood and lady ferns stood on cool earth at the mouths of caves, their fronds athwart the sun.

Once the trail led up a sharp slope entirely of bedrock—a metamorphic contact with granite. Patches of the glacial polish were scattered over its surface, its striations still evident.

On one of the steep boulder slopes with a thin mantle of soil were several lovely mariposa lilies in full bloom. Down the throats of some, amid the retrorse mauve hairs were yellow and black beetles sucking at the nectaries at the base of the stamens. As the flower ripened the calyx split and the stamens unfolded outward, coming close to the walls of the flower. A beetle climbing out after feeding on the nectar came up against the hairs, scrambling to get up against them and between the anthers and the flower tube wall. Soon it was pink with pollen. Sometimes the hairs caused it to tumble over backwards, being daubed in the process.

Finally the trail dropped down to a sloping meadow of clustered buckeye, golden cup oak, and near the stream, stately ponderosas in an open grove. I knew there was a sandy bench amid the trees and at the water's edge. I soon found it, dropped my pack, and began to set up the rain shelter right above the water's edge. Once that was done I set off for the parking lot where I was to meet Phylly. She and I had resolved, if at all possible, she would come on this trip, in spite of the pull of caring for Grandma. More than anything else it's a burden because Phylly's freedom is cut down. Anyway, neither of us were sure she could make it and I was to call in if she didn't appear after a while.

Anyway, I had a nice brisk hike down and then sat for quite a long time carving on my new alder walking stick, and soaking my shirt in a little rivulet and drinking from a little pool, and swatting mosquitos. Finally, at about 3 she arrived, a bit frantic and hungry because of a late start and Grandma getting sick again. I don't know how much is worry and concern on her part and how much real viruses and the like, but I do know there comes a time for breaking such dependencies, hopefully with as little pain as possible.

At any rate, we hiked up with Phylly feeling the heat and trying to cast off the strain. She got better and better as we hiked.

At camp we cooked dinner and soon it was dusk and time for the aboriginal group presentation, a bear dance. They (Louis, Charise, Susan, Susan, Mark T.) had been

working for days on it. We sat around a cleared dancing ground of sand cleared of needles, and cones, with a fire in the center. Off to the side, under a big ponderosa about 100 ft. away was the dressing room. In it the dancers were preparing. When they emerged it was four girls dressed as men dancers, necklaces of shells, feather breech clouts, beautifully wrought, scepters of flicker and guinea feathers on sticks, bear claws made of digger pine bracts in their hands, and dangling jingling strings of shells held from a horizontal stick in their mouths. To the side were the drummer and the chanter. The drummer beat on a bongo that they had laboriously packed in.

Off to the side stood a squaw, he (his—it was Mark Levorsen) wrapped in a shirt in lieu of a kirtle. He kept time, and looked solemn. The dance was in sacred sets of four (as with the Miwok) and consisted of various evolutions in the sacred dance circle (kept clear by the jester with a stick who shooed people out of the path of the dancers). It was a marvelous performance, done very seriously, with every bit of integrity the dancers could muster. It gave, I think, a real sense of the entertainment and involvement of the indian with his dances, and a feeling for the movement, solemnity, and importance of such rituals to people who knew bears best, and who had few resources, except shells and drums and the like.

Phylly sat there enjoying it immensely, I thought, and not long afterward we slipped off to our sleeping bags under the tarp overlooking the shimmering water of the broad smooth stream and the cliffs above.

May 15, 1978

Tuolumne River, Tuolumne County

In the morning I led everyone up to a grassy field above camp where the sun shone down and the mosquitos were mostly driven away by the warmth and there we outlined the energy exchange relations of living things, Marc Brown doing honors on the Gates equation, courtesy of a long computer printout sheet on which he had printed the equation. I followed on with the black body radiation laws (Wien displacement) and then we turned people loose with temperature, wind, light, and current measuring gear to look at the little worlds of leaves and insects and lizards.

Phylly and I trekked down the trail and I finally left her at camp no. 1 and returned up the hill to work with my people. I wandered from one group to the next trying to help where I could, finding, for example, the light people in dismay over their instrument and its limitations, and the current people in euphoria over some peculiar discoveries they had made about surface vs. subsurface currents.

Later we gathered and had a good session discussing what everyone had found. As always, even though the individuals thought they found rather little, in aggregate many, many interesting stories emerged, and much enthusiasm was generated. People were tired enough that it took some doing to get a Virginia reel going around the fire. I pooped out after one set, wondering if I was losing my natural energy, but then reflecting that I had hiked about 10-12 miles farther than anyone else.

May 16, 1978

Home, Very Late

Up early and packed, while my bacon was frying. I'd been careful about cooking the stuff in the dark because we have seen bears three times, once right in camp. But they did us no harm, and most people hoisted their gear up in trees.

After some good reports around a little fire (the day was cool and overcast in contrast to the beautiful clear weather we have been having) and it took the fire to stay warm. Then, up with the packs and down the canyon. I hated to leave as folks are pulling together into a loving learning group. It's wonderful how trust opens people to share their thoughts and learning, and to teach each other. The collective capability never ceases to amaze me.

At the entrance we ate lunch and I read my little farewell statement that I had prepared upstream. It was met by thoughtful silence since I don't think most people suspected that this was my last trip. Later, as we walked on Hetch Hetchy Dam we had a communal hug and I was carried around aloft (this was after all our hokey pokey).

Then home with much game playing and singing on the bus, and much good conversation with individual students. I can help several of them in various ways, including some of them who have had trouble getting anyone to care.

Home at 12:45 AM.

Remarks at the end of the Tuolumne Trip, 1978

We've descended along the gentle lower Tuolumne, moving a little faster, I think, than the river. That might be a mark, that we've not yet joined the river or the land in its pace, nor become wholly part of the pulse of the land the way the ancients of this land were, such as those women who gathered around the grinding holes at lower camp. But we shouldn't, I think, denigrate ourselves, as we are wont to do, for this. In all men—Native American, Eskimo, WASP, or Oriental—lie the same potentials. It's not who we are but what we build for ourselves that counts. To build, however, we must have a dream, a vision, we must first see. To me the dream is to build consonant with nature, for, we all know, nature is paramount, and will in her own time, rule.

So our task is first to see, next to understand her patterns, and finally to build those patterns into our own lives and cultures. That to me is why we have taken these four glorious trips together. Parenthetically, I couldn't have asked for better, more joyous, or loving companions, and I must salute my wonderful, gentle companion Larry.

I can't list all we have seen and can only guess at what we have learned together. I only know that such seeing and learning at its best involves love and trust and collective wisdom, and the right of each, however private, to share thoughts, visions, and perspectives on the world with each other in the knowledge that all will receive, welcome, and understand in his or her own way.

We've been part of grandeur. What else would one call climbing among the soaring monoliths of the Granites and seeing far above you in the canyon an eagle soaring effortlessly tilting this way and that to spill the air from its wings as it banks in that walled canyon of air.

Or there on the cornice of sand atop the Kelso dunes, the perfect arcing slopes sweeping away from us, marked only by our transient footprints and below us a vast landscape bearing the marks of primordial time more than the marks of our own activity.

There have been gentle times too. Those flower-clothed hills at Villa Creek where one could lay naked in the meadow with lupines nodding in around you and the sun

shining down to warm, and the gusts to cool one's skin in an intimate touch with nature. Here the Tuolumne is another such wilderness, sand banks properly spiced with pine cones and oak leaves to prick the bare feet, the little wandering streams of the meadows whose interlacing currents are so mystifying.

And joy! Why not I say!! Katherine says, "I always wanted to be a monster" as she spied the giant shadows cast on the wall of trees across Big River, to be followed by those wonderful mask battles featuring agile swordsmen pitted against an 80-ft. high King Kong.

Or twelve steaming bodies running with rivulets of sweet, cleansing sweat, set in counterpoint by the phrases and thoughts of each of us and finally capped by Dennis's elegant couplet with its imagery of the wild woods.

Or who can forget, ever, the [?] duo of Nancy and Charise, man and woman for sure, introducing us to the vegetable world. Or the wondrous recreation of a bear dance here on Tuolumne's sands, its rhythms and costumes so perfect. Louis the jester, the fierce bears, the flickering light on the chanters and drummers, the fourfold repetition, the solemnity, the jingling shells, the fortuitous flicker feathers, so artfully built into scepters and wands. I shall treasure my four digger pine claws saved for me by Susan.

I know that together we have seen some of the pace and intricacy of nature, something of the worlds within worlds where to insects a grassy field is an endless forest whose borders are only to be dreamed of for the tiny beetle down there at the base of those green giants, feathery hands of lupine leaves far above and giant siliques hanging up near the distant grasstops, and the nodding seeds of grass only now and then visible as swirling gusts of wind sweep unseen across the forest top.

Or Becky, Nancy's, and my venture into those giant oxygen-filled vaulted algal domes, glistening with sheets of water.

Intricate, interlaced, all things reaching out not only to each other, but transgressing the barrier of body form into the outside world through odors, dependencies or water, heat, wind, and light. And all this is seen through time, as we contemplate the flux and flow of ice, origins of mountains, the unimaginable forces of colliding sea floor and continent.

For all intents and purposes I leave you here, though I may travel with you as a visitor later on. I treasure the journeys we've taken and shared, and our comradeship and loving company as we've tried to see into our world together. My deepest affection and thanks to you all.

Big Creek: July 6-7, 1978

July 6, 1978

Devil Creek Falls Camp, S. Fork, Monterey County

Yesterday Steve Strout, Dick, and I started out for Big Creek Reserve to do some trail reconnaissance. After stopping off at Roger Nevill's house for a potluck lunch designed to introduce our Big Sur interns to various resource people, we continued on down to the reserve. Roger lives above the highway near Nepenthe. It's a pretty spectacular place, hanging on that ragged slope. There's an old spanish house and a stone

barn. Fences cling to the slopes and then hang precipitously on canyon walls. These canyons are choked with redwoods and tanoaks and bays, all dark with only fallen fronds for a floor.

At the reserve we braved the big shaggy dog, obtained the key, and drove up on the south highland near Gamboa Point. On the way up we clipped poison oak where it has overgrown the road—a messy job, but the heavy rainfall has promoted so much growth that it scrapes the car top in many places and intermittently threatens to whip in the windows.

By dusk we reached camp at the old man's grave amid the live oaks. The air on this high ridge was at least 10 degrees warmer than down in the canyon where the air draws. I tested for mosquitos and found none. They came later at night and around dawn, when they troubled us enough that we arose with the dawn.

Steve and Dick are great company—helpful, fun, and skillful. No complaints about nasty jobs, just, “let's do it.” Super, I say.

Stories and jokes around the hissing stove and then to bed. It was too warm to creep down inside the bags but it wasn't until much later that the bugs found us.

On up the road to Gamboa Point and David's Camp (his tent is still up). We walked in and looked at the potential camp by the big Kellogg black oak. It still looks like a fine, sunny, but protected campsite, and I will move ahead to getting tables in place. It's so different from the river bottom, so open, grassy, and on top of the world. It does sit, just back of the main break in slope before the Santa Lucias plunge off into the ocean 1,600 ft. below.

Then we traveled up to the shake makers camp road and hiked down it toward Devil Creek to the north. One can see the remnants of the camp amidst the live oaks, madrones, and ponderosa pine. I'd wondered where he got shake wood, which I presumed must have been redwood. We poked around the old shakes and indeed they were redwood. Soon I found that the road went on north from the camp ducking down along the west wall of the canyon leading north to Devil Creek. It's a pretty gentle road and seems intact except for lots of deadfalls blocking it.

I found a midden of shells, mostly mussels. We were close to the 2,000 ft. contour. What a haul for those indians! [map]. After this exploration we donned our packs and set off down the Devil Creek Falls trail. We will tag it and straighten out switchbacks and clear what deadfalls we can, all prior to YCC coming in to do the final work. We hiked down the trail first, clipping poison oak and branches of bay and tanoak mostly to clear the trail. At the bottom, where the steep trail switchbacks onto a little flat along the south bank of Devil Creek sits the forest camp amidst redwoods (some towering old trees), very tall big leaf maple, bay and willow. The slope to the north towers to a rocky, chaparral-covered crag while the south slope is a steep one (45 degrees maybe), but forested and covered with duff. The boys ogled at the lovely greenish crystal pools and the perfect 75-ft. white waterfall. I declared a break and said, “Let's go fishing or we'll have to eat canned Argentinian beef.” So we rigged up and soon were on the creek. I'd seen fish last time so was not too surprised to have fish bite easily. I had seven fish on the bank in 15 minutes, the biggest was 11-12 in.—beautiful stream-grown rainbows all of them.

Dick had four nice ones and Steve was hooking them too. We stopped taking them at 15-16 fish, that being all I thought we could eat for dinner.

After lunch we took our machetes and loppers, plastic tape, and we went off up the trail. We worked four hot, sweaty hours and were able to fix up the entire lower trail which was where the bad sections were, mostly from deadfalls and people then making new trails. We went back down to camp, hot, dusty, and wanting to wash off. I washed everything including all my clothes and me. We snoozed, explored downstream, where we found a long procession of lovely clear deep pools, some fed by little falls. Such fish as we hooked we let go. This included some more 11-12 in. fish.

Just before dusk I built a fire, poured my oil in a pot, and soon began to fry our catch and some potatoes. What a delicious supper, we all agreed. It was spectacularly good, if I do say so myself. We could have eaten more, but didn't need it.

Notes and a fire along the rushing stream. The light faded that greenish cast it sometimes goes on clear days just before dark.

*

Magdalena Bay: December 31-January 31, 1979

December 31, 1978

La Paz, Baja California del Sur, Mexico

I'm back in my old cabin on board the *Regina Maris* after a rather hectic time getting free from affairs back at Santa Cruz. I'd been worried about Phylly and Grandma Jessie, and had resolved that to some extent by convincing Ginny Norris to come up for a few days in mid January. Not that I had to convince very hard. Ginny was very good and instantly saw the need. Then, there were myriads of things to do before leaving, trash to the dump, wood on the porch, new kindling, the sheep, and a bundle of grant matters to settle.

Then, last night, at a party, Gene Bolt, the Chancellor's money man, took me aside and told me there was suspicion of theft by my administrative assistant. He told me no more than that xeroxing was involved, how I don't know. But it was pretty unsettling to say the least and there was nothing I could do but write him a note and leave. The flight down was uneventful, if sprinkled with delays. George Nichols came into the LA Airport from Boston and so we went down together with Rich Mulla, the engineer. Rich carried a great raft of parts for the generator engine, which had crapped out. It turned out he had a little of everything else too, champagne and a new T-shirt saying "Chief Engineer."

The *Regina* lies anchored off the municipal wharf, and was easily reached by the inflatable that came in to receive us. Not too much longer afterward and I was aboard, putting my various gear away in drawers and closets and now I sit here typing by a bare bulb, with a little drip coming in on top the bunk I do not occupy, a new ribbon on my old Olivetti, and a full tummy from a nice meal whipped up by our bouncy cook (Pegeen), including pie and ice cream. Little Pierce (He's not so little, in fact he's a big big boy, all full of enthusiasm) wanders the ship, getting happily into everything.

Tomorrow we watch Rich fix the engine, take on water, fuel, maybe some more supplies and then on the 2nd take off on our ventures.

The trip is designed to investigate some unknown aspects of gray whale life. The first question is how do they traverse the Gulf to Sonora, the second, what is the group at

Cape San Lucas-Cabo Falso doing, and the third, is there any social structure in the groups at the entrances to calving lagoons? The latter is the most interesting question. I think it likely that we will find some such structure, and this may be important in showing why lagoons are crucial to gray whales. We'll see.

The *Regina* is improved in some ways, the new lab is quite nice and neatly kept, the field protocols seem to have been upgraded quite a lot. Plankton samples are taken and recorded with some care, and there seems to be some attempt at labelling, though I note that the author or identifier's name is left off on the tags I looked at. The new galley is clean and much better than the old below-decks catacomb. The student quarters are utterly minimal, with only a long bunk closed by inadequate curtains. I'm not sure what people do for space for socks and the like. One poor pair of folks who want to photograph the expedition were abruptly turned away by George with their piles of gear, all neatly boxed, for want of space. I'm not sure how much advance information they had been given, but I will put as much as I can in my bunk room, which is the most palatial on the ship. I at least have space to move around, and my own head.

All in all the ship seems in want of a lot of minor repairs, like bunk lights (17 out) and little deck leaks over bunks. The other bunk in my cabin suffers from one such, down a rusty vent that drops rusty sea water on the occupant (there isn't any right now).

Little Pierce, a healthy and good-tempered young lad so far as I can see, takes up a lot of space in the after salon, where ship's business takes place and staff meetings are held. This room is now littered with teddy bears and xylophones for Pierce. So, from the student standpoint it is extremely tight, and I think the ship would do well with about 10 less students, but then I don't suppose she could break even. The experience on board does have strong parallels to those of an old sailing vessel. *The Beagle*, at 90 ft. about, had a bigger compliment than we do at 144. What life was like on such a ship is hard to imagine, creature comfortwise. There must have been very little personal space around anyone on such a ship. The need for this, especially for permanent residents such as George and Annie, is severe, and one can see why arbitrary decisions come to be made, and why Captain Blighs arise. The essential person becomes invaded and strikes back, sometimes hard, to preserve itself.

January 1, 1979

La Paz Bay, Baja California del Sur, Mexico

We're still at anchor, with the NE wind whipping in the bay and the double anchor chain stretched taut. But the ship is still since there is no swell. Everyone is on board now, including the photographers who have everything stowed under my bunk (I guaranteed it was dry). One gent from Louisiana, a GP named Mayo Emory, lost his luggage at the airport and is hoping they will deliver it tomorrow. He didn't look too happy, somehow.

The conversation level grows around the dinner table as folks become acquainted. Names are swapped and professions exchanged. We've a bunch of doctors, one resident, an engineer, a bunch of students, and about 10 Earthwatchers, who are with us for two weeks. George gave us a really polished instructional talk ranging from how to use the head to the penalty for bunk swapping (banishment), to the penalties for drug possession (put ashore at once), to more mundane items like avoiding hanging skivvies over the dining table. I spoke a little about the scientific plans, about my hope that we might begin

to gather information that would allow us to convince people to protect the calving lagoons.

It was a quiet day. I went ashore in an attempt to locate the photographers who I knew were freaking out because George made them cut down on gear, but I couldn't locate them. Then I finished Harrison Matthew's uneven book on whales. We were given our safety harnesses, and the watches are being started. All in all, the act is much more together than on our other trip, and things are running pretty smoothly. I have a nice assistant, Karen Miller, a young gal from Connecticut College, who is to help with things scientific. Tomorrow we go ashore for cement blocks (as anchors), some floats, and lines to set up a grid. We'll use this as a base from which to locate animals as they move about the entrance at Punta Tosca. It should help.

Pegeen is doing a fine job as a cook. We are all stuffed. She's a very Irish, independent, dark-haired gal, very much herself.

January 2, 1979

La Paz Harbor, Baja California del Sur

The day, which was blustery and sometimes downright stormy (the sea was breaking ominously over the entrance bar) was spent doing little errands in preparation for leaving. I went off with Kay Miller, my lab assistant, to pick up materials for our work at Tosca. We will put out an anchored buoy line there, two lines actually, using painted plastic floats and cement blocks. I called Bernardo and he won't be with us this trip, but plans to be along on the trip up in the upper Gulf, praises be. He says our permit is sent.

People got their safety harnesses and mates circulated around in the teaching mode, telling people about downhauls, futtock shrouds and the like, and taking some aloft. Our grandmotherly types were right up there at the upper topsail with the rest, and I'd imagine will be so when the sails are to be set at sea.

January 3, 1979

At Sea inside Espiritu Santo Island

Various final details were taken care of, we haggled with the fuel dock and lost—they wanted to charge 3X for a US boat than they charge for one of their own (fuel is subsidized for their vessels), so George simply didn't buy any and left. I gave a lecture on the gray whale and our plans and Kay laid out fine-grained plans for a whalewatch as we cross the Gulf. She is very earnest and careful and nice to work with.

The water gurgles past the hull now, the sails occasionally slat as the wind shifts, but mostly we plod along at 4-5 knots in pretty calm seas, on a NNE course for Yvarros, where we will look to see if gray whales are still present.

January 4, 1979

Mid Gulf, Between La Paz and Yvarros

I've been going on the slow bell today, afflicted by some bug that seems to be with several others—perhaps a flu bug, or turista-weariness, la grippe a bit, and general inability to accomplish much or think very hard. We had lollygagged around and found ourselves off Espiritu Santo, and in the morning cut in toward a rock at the NW tip of the island to look at the sea lions there. They were clustered on the south shore and SW tip of

the sedimentary island (or is it layered volcanic rock—at any rate it has layers and is pink). There were between 150-200 animals there, including a great many males, but I saw some females and some small young. They yelped at us nicely, blew bubbles underwater, and milled around when we came too close, leaping into the water. Out off the tip of the island 3-5 miles we came into a small school of *Delphinus* that cut across our bow, ignoring us pretty full. The day has been quite calm, a bit brisk, with a few clouds but mostly clear skies. We have been moving along in the absence of a wind in the right direction. George says we will reach Yvarros tomorrow night. I spent a lot of time today peering at vacant ocean, and sleeping in between.

January 5, 1979

At Anchor, off Yvarros, Sinaloa

The eephus abandoned me largely this morning and I felt pretty good most of the day. Only an errant cup of coffee set me off a little bit. It was quite a day. Until afternoon we sailed through flat vacant seas, on engine. About all we saw were birds flying by us toward shore. Prominent were brown boobies. Some showed us their lancing dives, piercing affairs that drive the bird deep beneath the surface. Phalaropes were all around sitting on the surface and collecting along slicks. We saw a group of large, all-brownish black petrels that I decided were black petrels. They swooped around the stern for a time. California gulls, a few Heerman's gulls, pelicans, a Franklin's gull, and a couple of jaegers made up what I could identify.

On the last cruise the ship had encountered fin whales in about 30 fathoms up by Guaymas, feeding. So we kept a sharp lookout and sure enough, when we hit about 35 fathoms the call went up "Whale, ho!" Welcome it was too, since we'd spent a fair length of time without sighting much. The moment I saw the beast I was pretty sure it was a blue—the very long, arcing back, often without any fin appearing at all, and then, now and then, the ridiculous little fin. Finally we cruised close enough to see the motley gray color. There were two traveling together—one on the order of 80 ft. and one other quite a lot smaller. I think it could have been a cow-calf pair. Then, not too far inside we came upon two more groups of whales, this time clearly finbacks—the much bigger fin showing nicely, and the darker back. We weren't able to approach close enough to see the coloration at all, but on the blue we could see the huge ramp of the nostrils, and the spatulate head. What a sight. Our crew were pretty pleased to see these great creatures, and the blue such a rarity for any one, cetologists included.

January 5, 1979

At Anchor off Yvarros, Sinaloa, Mexico

Soon we turned for the shore, which now appeared in the distance; lumpy hills, a light or two, and prominent peaks behind, the outlyers of the Sierra Madre Occidental.

We came in closer and closer and found ourselves in a broad embayment opening south. The low landhills and playas stretched way to the west of us as we penetrated the bay, heading for the lighthouses. Finally, the boxlike houses and water tanks of Yvarros itself could be made out to the west of the town. Common dolphins began to play about us as a large school intersected us, going on its way with scarcely an animal taking advantage of our broad welcoming bow. At least I think the bow is.

George could see masts over the bar, of draggers, and I could make out the old pier and groin, only pilings and rocks remaining. George took the *Regina* in toward the range markers and buoys and rather shortly bumped a sand bar. He attempted to turn and hit on both ends with water in the middle. He worked her around but didn't know which way lay freedom. Finally a skiff came by and we hailed her. Her crew told us the tide was high and that the deep channel lay off to the south of us. George wasn't sure we could get there and when a dragger came by (drawing about 11 ft.), we convinced the skiff people to take a hauser over to her for a tow. Not long afterward we were under tow, with our own engine on full, and the *Regina* bumped and objected but gradually and fitfully made her way into deep water. Presents to our benefactors, the hauser drawn aboard the *Regina* made her way to about 10 fathoms of water, where a hydraulic line decided to break. This controls the winch and means the anchor has to be hauled by hand. But George cleared the dragger channel and dropped the anchor. I'm told it takes 1½ hrs. to haul 100 ft. by hand. Well, it's a helluva lot better than being on the bar, and I know George feels this.

By the way, we saw nary a gray whale in the channel as we neared the bay. Probably we are too early. But tomorrow we'll take a look inside and see.

The more I think about it the closer it was. The fishermen who towed our line to the dragger told us high tide was all day, and low at ight. That's not the time to run aground, even if it was flat calm. I know from trying to navigate in such areas that it's apt to be a trap since it's hard to find the deep water, though the fishermen knew where it was. One finds culs de sac, and bars rising up, and such. But we made it. One of the channel markers was a sunken dragger, on the tip of the rock jetty, not 300 yards from us. That gives you pause too.

January 6, 1979

In Bahia Reforma, Yavarros, Sinaloa, Mexico

This morning we put most of the people ashore to beachcomb for earbones and other mementos, hoping to find whether or not calving of grays took place in the area by this means. Ann Dow and I went in the Avon with John Harrar of the crew. John is big, raw-boned, bright guy from Massachusetts, who does a lot of things on the ship. Ann, who is a teacher of English to non-residents at Harvard, and chief editor for some publishing firm, speaks much better spanish than I do, so I thought she could help. Previous conversations with fishermen at the *Regina* in the morning had produced evidence that the large whales are commonly offshore, and seen by the colorado fishermen who venture 20-30 miles offshore for handlining. As for whales in the lagoons, there were no mention, though they did discuss the toninas there (*Tursiops*). The three of us ventured in past the channel markers, and into the bay itself, which we later confirmed was Bahia Reforma. It is a modest-sized bay, by the standards of the west coast of Baja. It stretched away to the southeast and northwest from the channel, blocked from the sea by hummocky sand islands on both sides, vegetated mostly by a low scrub of *Croton* and *Asclepias*. There were some larger bushes and some *Allenrolfia* evident too as well as what were probably low mangroves. The bay water was extremely dirty from a cannery on its SW shore, which was puffing away when we arrived, three seiners tied up alongside. The water was literally stringy with plant growth and waste. At times we passed bars tenanted by flotillas of birds, pelicans, cormorants, terns, one great blue heron, grebes in the water, a shoal of buffleheads. Once or twice we traversed water a

couple of feet deep and saw botetes scooting away. A dead young adult female *Tursiops* lay on the entrance beach, probably caught in a gill net, from the looks of her tail. There were at least four groups of *Tursiops* in the bay and entrance. They came rocketing over to us, and swam ahead of us for quite a time. In close to the cannery a group of boys and men were jigging for lisas (mullet) in the offal-filled waters near the cannery outfall. A long gill net was set around the area. We inquired of these folks and received no encouragement that gray whales entered the lagoon now, though they did know about the porpoises and the whales offshore. Since our group produced no bones in evidence of gray whales I'm reasonably sure they are seldom or never here now, in the lagoon. The channel is about 12 ft. deep and flat calm at our entry.

After a beach walk, in which I thought I saw sure signs of badgers digging burrows in the dunes and crabs on the beach. Big broad tracks and many burrows of badger size. We headed back to the vessel and began our traverse across the Gulf. We'll go a bit north instead of south to cover new 30-fathom . . .

After upping anchor with the newly patched hydraulic line (which had chosen to go out all over the deck amidst the problems about being aground) we hauled up the anchor. (Rich had done quite a job with tape, screen, epoxy and stainless fishing leader). We headed out northwestward along the coast, out on about the 50-fathom line. It was like a lake. Nothing at all, except flocks of phalaropes and other sea birds were seen until dusk when Carl Rand (a student of John Stevens at Oxy) heard a whale blow, turned, and saw what we think now was a blue whale (small fin, very far aft). Just before we had passed through shoals of *Pleuroncodes planipes* and had scooped some aboard. They seemed smaller than those I've seen on the outer coast, somehow, about 2-2 ½ in. length to the body minus appendages. They dimpled the water in broad areas, and occasionally swarmed.

In retrospect, I don't think gray whales go habitually to Yavarros (note spelling, which is on the chart, and is the way it is pronounced, contrary to the cetacean literature). They may occasionally come there, but it must be later, and very likely wholly sporadic. The badly polluted water might keep them out now. I wonder how long the cannery has been going? Were they chased out? Does water taste concern them?

January 7, 1979

At Anchor, South End Santa Catalina Island, Baja California del Sur

We transected the Gulf today at the level of Carmen Island, coming into that island at its northeast tip. It is a typical barren, reddish Gulf island, shaped a bit like a claw hammer with the head pointing north. It is composed of two ridges and a little graben valley, the longest ridge the handle, and the other the head and claws, separated by the little valley. The shore we travelled was composed of sharply faceted andesites, mostly, with the old erosional grade showing a bit more than halfway to the crest of the 600-ft. ridge, and below, steep fault faces dropping into the sea. The graben holds a salt deposit that had been mined since Spanish times, and which was once called "inexhaustable." I'll bet the pressures now from Japanese steel industrial needs alone, would exhaust it in short order.

The day was breezier than yesterday, but clear and crisp. With the ship going downwind George switched to sail and we set off silently, only the burble and hiss of water along the waterline and the pulling of the sails on lines and rigging. The watch

produced nothing until dark when, just as we were coming into the little cove a porpoise raced in in the dusk, leaped and stood briefly on its tail. We don't even know what it was.

The east shore of Santa Catalina, like Carmen, falls sharply into the sea, with faceted cliffs. Only Santa Catalina is at least half again as high. Rock exposures are of banded rocks, probably volcanic, some more homogenous and light-colored rocks, some fissured with thin dikes. In places the steep clefts are filled with scree right to the waterline. A fan just above water juts out at the northeast end of the island, and not until the south cove is reached is there a beach of prominent proportions and a good place to land. There, a light gleams intermittently from a sharp ridge to the west, a pocket beach circles along the shore, backed by a butt of low terrain before the ridge of the central island mass rises. I couldn't see much in the dark, but tomorrow we will go ashore briefly, before heading for San Jose and Bajia Amortajada.

The atmosphere on board is good—the calm seas have cut seasickness to a minimum, and only one of our people is sick, Mike of the photo crew, who was up today from a bout with the flu. He looks pasty but better. One person I have enjoyed is Bea Presky, the oldest gal on board—she could be in her '70s, but up the mast she goes, and stands all the watches. She was a Kaiser welder during the second world war and rose to do the bow work on the biggest tankers. She says it's like needlework, and that to choose good welders women who do needlepoint would be best. She's done some sort of social work too, and psychology and is really a level, low-key person who obviously lets nothing at all stop her.

My own lethargy is passing, and I did a little sewing on my old jacket today, putting velcro on the sleeves and whipping some torn places. Tomorrow the other sleeve.

Oh yes, I saw a red-billed tropic bird today, north of Carmen, and the ridge of Santa Catalina is thick with big cardons, and we understand there are fan palms and two little springs and some tinajas on the island. Where all this is, I don't know.

January 8, 1979

Santa Catalina Island, Gulf of California

After breakfast, and with a few looks at the lowering sky, we went ashore in the rubber boat for a short hike on the island. The wind was whipping whitecaps offshore, and big fronts of clouds periodically swept over the ridge crest. George thought he might possibly have to recall us so we were to listen for the ship's horn. But it didn't come, and the wind was no worse when we returned than when we left.

I was surprised to see the beach composed almost entirely of smoothly rounded granite cobbles, and all the land underfoot on most of our walk of decomposed granite. Here and there dike material of different rocks showed. One pale green dike transects the rocky headland to the west of the anchorage and other smaller ones, full of hornblende and quartz crystals were scattered about. The cactus were scarcely scarred, and fully expanded with moisture. I saw the sour pitahaya, achile, or fishhook cactus, the cardon, a staghorn, and a huge form of the barrel cactus. Jojobas were everywhere, and in places the ground was littered with their waxy beans. I showed those around. Palo santos, and a small elephant tree were there too, and I was surprised to see *Marah* vines growing, especially on the beaches at the strand edge. They were small leaved and did not send their vines so far as the California form.

Up on the bench, perhaps 100 ft. above sea level, were strewn various marine shells such as turban, limpets, and the like, gastropod opercula, sea urchin tests, and some very heavy shell fragments that were big enough to be from conchs. One gal, Denise, came up with a boulder of coral. How the shells got there escapes me. I saw one polished beach boulder nestled in the subangular boulders around it at about that height. There was also the petrous bone of a porpoise, very weathered, the bulla gone and no other trace of the animal.

Kevin had zipped up the mountain and came back with a handful of terrestrial snails—these long turrets with a very flat funnel at the opening of the operculum. I urged him to save them, as most of these land snails are endemics, and this snail is especially far off shore. Kevin also saw some small lizards that sounded about *Uta*-size to me, but he didn't catch them.

We returned to the ship, upped anchor and quickly set a few sails—upper topsail, topgallant, jibs, and set off downwind at a great rate, going inside Santa Cruz Island, a rugged, mountainous little place north of San Jose, and thence on to San Jose. The wind pushed us mightily and all around us whitecaps slid tumbling by.

The group of us hiked over the ridge from the SE anchorage at Santa Catalina, I forgot to note, and could see a SW anchorage that looked better than the one we occupied. The bay, with some stacks, is broader, a nice beach backs it and the land rises more gently in a northeasterly direction from the shore. At least two major drainages enter the shore there. One I could see, cut back into the main mountain mass, extending a long way north. At its mouth I could see a fairly broad sandy arroyo flanked by rocky bluffs. It may be up this arroyo that there are supposed to be tinajas and fan palms.

Santa Cruz Island is about four miles long, I'd guess, and is a tear-drop-shaped granitic mountain with big, faceted cliffs. At its south end I'm told one can land (to the west only) and there is an anchorage. Big whitish dikes cut the main gray formation in several places and one could see that large amounts of boulder waste had cascaded down the hill. San Diego Island, about four miles to the south, looks similar, only smaller. From the west it seems to be a single fin of granitic? rock rising about half as high (perhaps 600 ft.) as Santa Cruz.

As we cruised this coast what we think was a sperm whale blew repeatedly as it passed us to port, never showing anything except vapor. Then, shortly afterward, pilot whales began to go by us in tumbling ranks. One individual leaped free of the water repeatedly, not lifting its tail high over the water, but nonetheless clearing it—most unpilot whale-like in my experience.

Now we cruise with engines toward the anchorage. I've been working on the Hawaiian manuscript. Dull work, for the most part, and so distant that I lack the little nuances.

We anchored at the north end of the Bajia Amortajada on San Jose Island. A little rancho is to the north beach . . .

January 9, 1979

Bahia Amortajada, San Jose Island, Baja California del Sur, Mexico

A bright, sunny morning and the water flat calm. the arcing, sandy shoreline ends in little bluffs and rises behind to the 2,000-ft. mountains. Across is the magnificent Sierra Giganta scarp. Broad, u-shaped valleys cut into the structure in an east-west

direction, and are sliced as by a knife in the north-south direction due to a fault scarp exposing the broad-banded structure and producing a series of castle-like bluffs. One can see that the draws are heavily vegetated, and to the biologist, inviting.

In the calm water astern of the ship we watched a large group of diving grebes. They massed together in dense flocks wider than long and then dove in near simultaneity. Sometimes the group broke into three parts, and sometimes it dove en masse. The birds stayed under from 30-40 seconds and stayed at the surface from 15-40 seconds. Diving seemed to be signalled by the front ranks diving and a quick wave of diving followed, and all were gone in a matter of 3-5 seconds. I presume they are feeding underwater and the massed formation is used to herd prey, though of course we cannot see this. The birds are small grebes, dark in color above (dark brown, I believe though the light is wrong). I saw one rank of birds, about 6-8 deep and 30 yards long. [Drawing.]

When they dive there is a flurry of water, either from wings and in my impression, also webbed feet.

The anchorage of the bay is extraordinarily protected. To the north a spit juts out and overlaps the chain of the Giganta from the winds of the channel, and the same happens to the south where another, larger spit extends out, and once again locks the bay from prevailing southerly winds. A low, rocky ridge of reddish rock rises from the bay floor at the mouth there too. All in all it looks as if it might be protected in all winds, at least to some degree, though a secondary bar and strand line back amongst the cardons and mesquite make me think that occasionally it may get violent in here. Later I found a pilot whale skull up 10 ft. on the beach bluff, with cactus growing out of one nostril and a gecko (*Phyllodactylus*) in residence. It must have been thrown in there by the waves. The skull, a good *G. macrorhyncha*, was taken for Bernardo Villa.

The class went ashore toward what had been a sperm whale stranding. We had hoped to look at a skull and tell people about it, but it was gone, so we walked up the strand looking for less exciting things. Up at the north limb of the bay were a group of buildings on the beach, and then about a third of the way down the bay a small rancho lay nestled in the mesquites just above the strand, its thatched roofs and ramadas inviting one to shade. I'm sure that's especially true in the torrid summers of this place. The guide book says there's a well at the rancho and one can sometimes obtain a little gasoline when they have it. Boats lay pulled up under a ramada. Women and children went about their business under the thin mesquite shade, some brightly dressed. I'd guess the life there, though spartan, was not one of want. The sea is too rich here, and all in all it must be vastly better than life in the vast ghetto of Mexico City.

We landed a short distance below the rancho, at a very decomposed skull of a baleen whale, and shortly came upon 13 giant squid, lying scattered along about 100 yards of beach, newly cast ashore and still undecomposed. They were rusty red in color, the largest about three ft. long (mantle). I took the mandibles from two of them, big black parrot beaks, and cut away the hooked and stalked sucker discs from the tentacles. What could cause such a stranding puzzled us, since they did not seem to have been caught by fishermen. Then, over the VHF walkie talkie we heard that 50 sperm whales had just stranded at Mulege, about 100 miles to the north. Do the squid contain a vector that when fed upon by sperm whales causes the latter to go dotty? Who knows, but at any rate the presence of these prime sperm whale food here, certainly correlates with the presence of

sperm whales in the area. George saw them here on the last trip, and I think we saw one yesterday.

On down the beach we went, the slopes above rising to a rather low ridge clothed with thorn forest. Various flotsam kept us happy—sea lion skulls and jaws, the pilot whale skull, whale vertebrae. I convinced George to take one for Pierce's pottychair, which he can use when he gets out of diapers. Others had sunned themselves and walked the other way. The tide had dropped and the flat extended out a long way so we had to pick our way carefully in the rubber boat before deeper water arrived not far from the *Regina's* anchorage.

Soon we were up and off, cutting through the channel at the southwest corner where some isolated rocks stood a fisherman's camp that had been there for forty years or so. They bring in water from La Paz in barrels. How they get their fish out escapes me. To our port, on San Jose was the fine mangrove lagoon, filled with water birds, and I suppose, oysters and perhaps the wonderful hacha (*Pinna*). San Jose would be a great place for a camp some year.

At Sea, NE of Espiritu Santo Island

After leaving the island the wind fell, and at night we pottered along, under some sail, but making very, very little headway in these light breezes and with our grassy hull. Late, the engineer charged the batteries and started the engine toward Cerralvo, lying craggy in the distance, a piece of the North American plate pulled from the Balsas Basin in Jalisco, and taking with it some of its life—*Sator*, *Bipes*. So, to sleep. I'm getting bunk elbow—an affliction that feels just like tennis elbow, but comes from bracing oneself against the bunk with these angular protruberances.

January 10, 1979

At sea off of the Cape of Baja California, to the east

When I first came on deck we were somewhere south of Espiritu Santo Island, and Cerralvo was ahead of us. A good many times today I came up on deck to look at that fabled island through my glasses. It is a precipitous fin of rock, dissected by steep canyons that are not hanging above facets, at least on the west side, as so many of the more northerly islands are. Part of the island, to the north, looks granitic, part of darker rock fissured with dikes, and part volcanic. Toward the middle of the island there is a single tuff stratum, just above sea level, clean white, like a bank of pure abo, or Ajax Cleaner. The island is much less precipitous at the south where rolling terrain borders the sea, and where a pretty extensive sand spit, topped by a light tower, is located. I saw only one little cabin, on the spit, to indicate occupancy. Elsewhere, it was mostly clothed with mostly dense thorn scrub. I could see palo blanco trees up on the ridges, cardons, and in the canyons, mesquites. At a few places, as at Puerto Limon, near the north end, the canyon bottoms were green enough for subsand water, or tanques, or maybe even a spring. Across the channel at the south end there is quite a village, and some large buildings. I'm sure it wouldn't be difficult to reach, given a little patience.

Only one group of pilot whales was seen today—near the north end of Cerralvo. Brisk breeze today, with many whitecaps cascading by us. We're tacking toward the point, under sail, with the engine off.

January 11, 1979

Cabo San Lucas, Baja California Sur, Mexico

One baleen whale, with a pretty good-sized fin—probably a finback, was seen today. The sea flattened as we came into the lee off the Cape region, and it warmed up. People began to appear topside and climb the rigging in the warmth. Boat traffic increased as we came into Cabo San Lucas. The new collection of hotels, cabanas, moorings, and the like, lined the cliffs. Once in the harbor it was pretty vastly different than when I first visited there in 1948. Then it was a cluster of dusty little houses, a crossroads of dirt, and the empacadora. Now it brims with spanking new hotels and a population of maybe 1,000 tourists and a resident population about equivalent.

George and Annie laid out the Captain's party on deck—lots of rum and scotch and the like, singing, bird calls, and general merriment. I collapsed in the sack about midnight.

January 12, 1979

Cabo San Lucas

Well, some whales came in, three of them off the Hyatt Hotel just the east of the harbor, and others were seen to the west, so the little group is here again, and maybe we'll get some clues about it.

There is a single sea lion in the harbor too. I wasn't aware they came this far south, but there they are.

Today I called home (everything OK), did a little shopping, met some of the new people, and by golly, Jim Darling showed up, and is nicely stashed in the cabin with me, having left Hawaii to be on board.

Tomorrow we leave after the immigration matters are taken care of.

January 13, 1979

Hove to, off Cabo Falso, Baja California Sur, Mexico

After immigration and a few last-minute purchases we hauled up anchor and headed east out of the harbor of Cabo San Lucas. It is a bright, blue, calm day the sea almost glassy calm. The day was spent making a search of the Cape San Lucas-Cabo Falso area for whales. It is the same area we noted about 35 animals three years ago. It is perhaps three weeks earlier in the year this time and the animals are sparse, but nonetheless here, and all were over the nearshore banks, some right at the outer edge where the sea drops off into abyssal depths a short distance offshore. Jim was all over the mast and I made it up over the futtock shrouds on the mainmast for a session of watching. The day was enlivened by a floating, dead leatherback turtle, one flipper missing, a few sea lions, and a very large herd of common dolphins, plus at least one small rorqual that I suspect to have been a minke.

The entire exercise is nicely on paper. What it looks like to me is that the whales come down to San Lucas, and to them the cape is this underwater bank that juts out quite a lot farther to the south than the land does, and it was there the whales were concentrated last time, and are concentrated now. Too few this time to give a definitive picture though. We'll heave to tonight, and in the morning will make an attempt to photograph the grays here, for individual identification. Jim will probably work in the Avon rubber boat.

Not much else. I'm moving shelves in the cabin and fixing the damn light switch.

January 14, 1979

At sea, off west coast of Baja California, enroute Punta Tosca

Last night poor Jim succumbed to a combination of recent flu, two nights with no sleep, and a wallowing ship lying to offshore. He was really deathly ill, and when he began to bring up a little blood, along with problems at the other boca, I called George. Jim was to the stage where he had to get ashore, no matter what. It was life, almost. At any rate George gave him a 1cc shot of Chlorpromazine which stopped all the symptoms dead in their tracks and Jim slept the night and most of the next day.

We had drifted 20 miles offshore during the night and had to beat our way back in. On the way we picked up a drifting Avon 13-footer with a Merc outboard. George located the owner by radio and as we passed San Lucas a boat from the Port Captain came up and towed it in. We saw very little going across the banks—no gray whales, only a school of *Delphinus* and a small group of *Tursiops* that came to the bow. Up to the west coast, with only one gray whale sighting. I spent time making up a schedule of activities for Tosca. Now if the whales just cooperate. I'll attach the schedule for the record. It will keep us all busy, but will allow a reasonably long period for observation, and we should get quite a lot done, providing the animals are in, as they should be by this time.

January 15, 1979

Isla Santa Margarita, Punta Tosca, Baja California Sur, Mexico

The weather calmed even more so as we slipped through glassy seas on the way up the west coast of Baja. It isn't always thus. Much of the time we were 10 miles offshore or more, and encountering largely *Delphinus* schools, which were remarkably abundant. Most had totally dark dorsal fins, though Carl Rand reported one with a white center to the fin. I thought their dorsals were obviously falcate and un-*Delphinus* like. Jim, by the way, is up now. He's on his way to recovery after a really rough time of it, though after George's shot he was mostly just tranquil in his bunk sleeping.

As we neared Tosca we cut closer in shore and began to see whales. By the time we were five miles S. of the point or so I began to make out spouts against the cliffs, all along from outside the point to Isla Cresciente. There were whales inside the embayment, and there were whales over the sand bar outside Punta Santa Marina. The wreck, that lies inside Cresciente, shows over its top and I think will make a good range marker, but I'll have to calculate all the angles again.

We cut across the tip of the bank, as the fathometer chose to go out. George quickly got Scotty in the chains, and found we had only three fathoms or so, with us drawing a little over two. We worked our way into deeper water, anchored, had dinner, and here I am writing notes prior to talking to the new earthwatchers about gray whales, and then observations. A lecture, discussion, on observation, and tomorrow we begin to get our buoy line out.

We made it!! The place is full of whales—under the bluffs, breathing all around us.

January 16, 1979

Punta Tosca

As the day wore on our anchorage became rougher and rougher. The tide when it floods opposes the incoming swell, and if it is very high the result is a tumultuous sea across the Rehusa Channel. Two tiers of spilling waves and confused sea crossed nearly the entire entrance, except for very near to the Santa Margarita shore. I guess the breakers were low enough that one could take an Avon through with some chance of success, but going close to Sta. Margarita is much the better part of valor.

The day was overcast, with cloud banks, broken with some patches of blue, passing overhead. A wind eddy seems to exist near the surface at our anchorage, with the higher clouds coming in from the west or northwest. All day the sea was choppy and the boat rode up and down in the swell, making viewing a bit of a problem for me, especially any duration of looking through my glasses. Jim and Gregg went ashore to check out the possibilities there, and immediately fell in with the people at the lighthouse. They disappeared over the hill and as we learned later, they hiked a couple more larger ridges, and reached a sea lion beach all covered with bones. The ones they brought back were from sea lions. Then they clambered up the old road and watched the bay, and were delighted at the vista. They brought two folks from the lighthouse back with them, Rodolpho, and one whose name I couldn't catch. Rodolfo's father had been at the lighthouse for 38 years.

We placed buoys, with George and his deck crew doing nearly all the work by radar. I watched for the boat and buoys and more or less supervised them around.

Then, we moved the vessel and rather undid all my angles and mountain profiles for locating buoys and the like.

I made a count of whales from the vessel that I am sure represents a minimal count of animals in the area. Most of them are inside the first or outer breaker line.

I lectured on locomotion and then typed notes and planned for tomorrow. The ship wallows, but it's calmer in close to the lighthouse. George, however, is worried a bit about the wind and may haul anchor for the outside if it keeps up.

The whales aren't coming as close to us as I had hoped. Let us hope that a little acclimation will bring them closer. I've had several views of breaches today, none closer than perhaps 100 yards, a few pitchpoles, and a few apparent mating groups. But, it's too difficult to see much with the animals so far away.

January 17, 1979

Belchers Cove, Magdalena Island

During the night the swell came up, along with the wind, and after breakfast George took a look at the scudding clouds coming in from the SW and decided we'd better head for shelter to the north, in Magdalena Bay. Would I agree to changing the schedule, he asked? Of course, I replied, knowing we couldn't work and that the bay was getting dangerous, and also knowing George was going to do it anyway. (As rightly he should.) Anyway, we hauled up the anchor and made our way around the submerged rocks at the tip of Punta Tosca, then set sail with the wind behind us, and the rolling swells urging us up the coast in the gray mist.

Santa Margarita's windward coast loomed large and indistinct, a white line of breakers the most easily seen. As we travelled onward the storm closed in and rain came in gusty squalls sheeting across the deck and dripping from the now dark sails. The old *Regina* plunged into the sea, windening[?] waves contesting the regular swells coming in

on us, making tosscaps and cascades. Some, nearby, could be watched as they curled, emerald green and fell back in white and bluish drab. Somehow the storm petrels that had been missing came out, and now and then cut near us in their tipping swift flight, riding the pressure of air returning when wind hit sea. As we rounded Tosca a great flotilla of tijeretas, or frigate birds, rode silently and without wing movements, the flock extending from a mile offshore toward the misty highest peak of the point; hundreds of birds, all spaced in the rising air of the storm and riding it in silence. Later, graceful Bonaparte's gulls flew near, white and pearl gray, with a white margin on their tails. A couple of humpbacks rose in the rough sea, rolled, flinging their long, knobby fins into the air, and then breached, so all on deck could see their pleated throats. A few other spouts were seen, of southward-moving whales, presumably grays, even though we traveled about four miles offshore and in 50 fathoms of water for more most of the time.

After this the animals slacked off, and only a couple more were sighted as we changed course and headed for Belcher's Cove on Magdalena Island. This is a sandy hook of land discovered in 1602 by Sebastian Vizcaino, and then used later by whalers to work the whales of Magdalena Bay. The bay is so much easier to enter than Scammon's that many vessels worked here, and animals were rendered down at this station, which was used until the 1930s when the last whales were taken before being given international protection. Since then it has fallen into disrepair. We're told the old try pots are still there, boilers and the like, and a great pile of whalebones. It is mostly a camp for fishermen living in a row of shacks, with their nice fiberglass boats pulled up on the strand in front. The cove is flat calm and occupied by a mixture of small yachts and fishing boats. It is protected by the bulk of Mt. Isabela behind, and good for all north winds. We're told there is no water here but it can be had at Puerto Magdalena five miles up the beach at Man o' War Cove. Belcher, by the way, was a British Navy officer who did the survey of the bay. I'll bet he surveyed Santa Rosa Island, too, where there is a Belcher's Bay.

We had a nice meal of roast chicken and various fixings—beans, custard, etc.

January 18, 1979

Belcher's Cove, Magdalena Island

Not long after breakfast we hoisted anchor from the calm little greenish water cove, and made our way out into the bay and then ran a grid pattern across the entrance counting whales and noting the direction of the traverse. I climbed up the Jacob's Ladder on the foremast and watched from there. George put us over a number of whale groups, some very close at hand. I tried hard to see what was going on, but am mostly at the amorphous stage. Here is a distillate. I saw no actual mating, not even a penis, though two others reported seeing them. I did note that almost none of the animals I saw today were really singles when one waited long enough they usually resolved into duos and trios. The largest group I counted together was six animals, though I sometimes saw more spouts in a given area than that. I saw two whales swim toward one another and touch snouts. I saw animals tiered, on top of one another, or closely aligned side by side, with a third touching them at the region of the vent at about 50 degrees. I saw animals roll, and dive down together. I saw them roll and throw a pectoral into the air, or raise their tail, nearly to the level of the vent and hold it aloft for a measured five seconds before slipping back. I saw sideswipes with the flukes by an animal on its back. I saw one vent,

and think it was a male. I saw an animal change course and sharply approach a wuzzling group, joining them. And I saw two wuzzles approach one another and intersect and ignore one another. All this fits the mode of a female beset by persistent males, swiping with the flukes to drive the others away, and I did see a great size disparity in the animals involved. There were no calfs in the area. It's a start.

Then we headed back for anchorage and finally found it off the little village of Puerto Magdalena, which is a cluster of houses and boats in Man o' War Cove. All the lights in town are on even though it wasn't dark. I think they don't have a switch, but do have a generator.

Well, much typing, and now to sleep. Tomorrow we go ashore to Santa Maria Bay for a beach walk.

January 19, 1979

Puerto Magdalena

George and I decided that it was about time to let the students and earthwatchers, and incidentally us, take a stroll ashore. We chose the southern limb of Santa Maria Bay, on the outside of Isla Magdalena. Everyone took lunch and trooped ashore from the rubber boat at the base of the long line of dunes that form the spine of the island here. We traversed the island just above Howland's Lagoon, a little mangrove-covered inlet, and came out on the almost hemispherically curved Santa Maria beach, which extends about 10 or 15 miles north to mountainous Cabo San Lazaro. The day was overcast with about 20-25 kts. of NW wind whipping along. The dunes are low and hummocky here, covered with *Lycium* (with red fruits), *Abronia*, a couple of euphorbs, and a pretty evening primrose.

The beach on the outside was littered with flotsam, the way some of these Baja beaches are, including a note in a bottle, which seemed to be mostly swearwords, probaly put there during a good drinking bout at sea. Odd bits of manilla line, polypropylene (which lasts), timbers, and many animal remains; pieces of sea lions, a *Delphinus* skull, some bigger whale vertebrae, and finally the skull of a blue whale buried upside down in the beach. I paced it as 18 ft. long from occiput to end of the long, trough-shaped vomer, and about 8 ft. in zygomatic width. I can't think it could have been anything else at that size. Lots of folks dug away at it but when I left to walk back they were still digging away and were far from unearthing even the upper skull. I took my leave, carrying a few pieces of colored driftwood for a collage, and made my way across the dunes—twice as wide this time—to the Bay each. It is much cleaner, and the bay waters broke only in little running waves diagonally on the beach with the tide. A sand bluff stood back of the beach where the tide had cut into it waist high. I chose the hardpacked sand for walking, and shared it with busy fleets of little plovers, sandpipers, and sanderlings. It was a nice alone walk down about three miles of sand, accompanied by the wind, the sheet of blowing sand on the beach—whitish moving sheets of sand, hurrying and crossing into one another, so thin they had no dimension of depth. It is there, within a few millimeters of the earth that most sand is carried. The wind was on my shoulder, and blew up the backs of dunes ahead of me, sending little spurts of sand upward to plume out and blow away. The moving sand incised the still cliffs, channeling, slicing at bluffs, hollowing, sculpturing. For long stretches new drifts piled over the cut cliff onto the beach.

Once I came upon a little pillar of sand, five in. high with a narrow base rising to a three-sided hammerhead-like top. As I watched I wondered why it didn't fall, and when it would. I could see the sand cutting at its base, blowing behind it against the cliff face, and sluicing out behind, piling there, and periodically slumping. I timed these slumps. One came every 30 seconds while I watched, made of the hurrying sand stream. Still the balanced rock of sand stood. I realized that its top was being planed down by a sand sheet blowing off the cliff top, to facet it. The stream eroded and just beyond it piled on the cliff top, only to slump now and then to the beach. It did this nine times while I watched, and the little pulse of sand behind the pillar, uncounted times. Everything was in miniature and speeded up. Easy enough to imagine being a millimeter tall under that great balanced rock, wondering what equilibrium let it stand. Instead I looked down from above and wondered about the equilibrium. Why didn't it fall? How could it be sculpted in some unseen relation to the wind that gauged its weight and balance? I could see none, and yet it stood. I finally turned on down the beach. The sand sheet had frosted mats of purplish stringy algae across the beach, making pretty patterns above the sand. The sand cascaded into the sea to disappear in the clear greenish waters.

This must be the nasty season for sanderlings. One that seemed no different than the rest to my uncomprehending eyes, lowered his little black bill, hunched his shoulders, threw up a ruff of feathers and rushed at his fellows. Even I knew he was angry, though at what I could only guess. I seemed to the casual and distant observer that it was space on the beach. And it was just sanderlings, not semipalmated plovers who shared the strand. He raced between them dozens of yards toward an offending sanderling who ran in a blur of legs away along the water. Not enough. He was finally driven into lovely, sharp-winged flight, to alight 100 yards farther on. Not enough. Our sanderling, head lowered, flushed it again, and other ones two [?], running with great purpose between awed plovers who stopped to watch him go by. I say him because it was, to me, a himmish display. Later I saw another sanderling with the same attitude, and noted that they tended to be scattered instead of in their usual (to me) flowing groups, going in and out with the waves. One of the nasty sanderlings gave what I think was a consummation signal—a couple of ritualized probes of the sand after a chase, like a man dusting off his hands after disposing of a problem. A nice old osprey perched on a snag as I walked along and rose in their kind of loose-jointed flight, a fish in its talons. We waited a little while on the beach and Scotty the third mate came in to get us. Now I'm trying to clean up yesterday's notes, in preparation for the onslaught of tomorrow's, which are likely to be greater in amount.

January 20, 1979

At Anchor, inside Punta Entrada, Magdalena Island

We put a field party ashore at Punta Entrada, led by Jim Darling, to check on the movements of the entrance group. They climbed to the top of the little hill there, from a pocket beach landing, set up the telescope, and watched all day. They found that the group of whales spread out at times, but that it kept its basic station. The whales were a mile to mile-and-a-half offshore in 16-20 fathoms of water. Apparently they are using bottom topography in some way, perhaps because it produces eddies or upwelling, to stay there. Looking at the chart shows them to have been inside a sill that rises about 30 ft. from the bottom, to 11-12 fathoms.

On the *Regina* we tried hard to come up on wuzzle groups by pursuing them and had very little luck really. The groups dispersed as we came near, and then reassembled farther back in the bay. The effect was interesting. It broke the basic number down to groups of two and at most three. One could see them streaming toward the new aggregation spot, and beginning the courtship, if indeed that's what it is.

Then, later in the afternoon George asked me if I thought we should anchor, and I said sure. So he took her in to the place off Punta Entrada where we saw most whales and dropped anchor in about 20 fathoms of water. The result was dramatic. Very soon whales were drifting near us, and coming up alongside under the bow, and wuzzles were forming, and one drifted alongside for better than half an hour.

I had watched all morning from the after mast shroud and it was raw and cold, and by about 4 when we picked up the shore group I was tired and took a short nap before dinner. The meat wasn't done so I gave my lecture early, on phocid seals. Then, talk with Jim and Karen Miller, our fine lab gal, and did a little seamstress work on my old field jacket.

Notes (summary impressions):

The courtship, if that is what it is, is relatively languorous, and not at all like the high-speed chases I have seen between two animals and a mother with a calf back in the lagoons. There is no very evident avoidance but instead attraction. The pairs of animals tend to aggregate if let be, into wuzzle groups, usually within about 50 yards of each other, and these persist for long periods, presumably of courtship. It seems constant, and I saw one group engaged in it for 40 minutes non-stop. How much longer is anybody's guess. Jim saw extended penises and I sexed a female, so both sexes are present at least here. The groups do congregate in a given area, that we believe to be demarcated by a sill about 30 ft. high, on the bottom running between Punta Entrada and Punta Redondo. The animals gather back of it, at a place where there may be a significant eddy, right off Punta Entrada.

The wuzzles may be composed of 5-6 animals, but the basic unit to which they divide if harrassed, is two or three. Thus we have parced apart the wuzzle and find it to be made of units, the others are supernumeraries that probably come along for the excitement, like dogs around a bitch in heat. And they go at it for an incredibly long time of almost continuous courtship—perhaps a couple of weeks of it.

In assessing the reasons for these entrance aggregations one must not forget that gray whales have been shown to have most unusual reproductive resiliency, having come back from near extirpation twice in the last century. They are, in this respect, like no other whale. The compressed migratory path, in which whales are near other whales the whole way, the long testing and retesting of sexual readiness by way of prolonged courthip, must leave essentially every ready female impregnated. The separation of mothers and calves by exclusion of wuzzle groups to the entrances, and their departure before the females with calves leave the lagoons cuts down the wasted time when males try to mate with resting or nursing females. The difference in behavior when a male contacts a female coming to readiness and one nursing is so great it strikes a strong parallel in many other animals that have repulsion systems on one sort or another; aggression, development of male threat colors, flight, separation. Like most other biologic systems that of the gray whale is certainly stochastic. There will be a modal time of sexual readiness, just as there is of birth, and it may be necessary for the males to

travel with the non-parturient females the whole way to insure that all females are covered, to use a sheepman's term. The mean of the mode may hit at these lagoon entrances.

I'm impressed that the whales stop migrating at these lagoon entrances. They have reached a destination, and that's important. Like the females with calves they must be responding to light cycles on an annual basis. They must also be "getting their southing out," and very likely they are undergoing both a growth and recrudescence in both sexes for reproductive systems—testes and ovaries, ova and sperm, and associated hormonal levels. I would expect the male cycles to "cover" the females; that is to be ready longer than the female, to catch all members at their peak. And I wonder about sex linkage in the underlying genetic determination of these events. How much crosstalk is there between sexes that prevents the males from stopping short when their mission might be done, while females go on. If the females went on, one might have the spectre of only non-parturient females going without males to the lagoons, all lonely and non wuzzly.

Better, more likely and simpler for the sexes to travel together, and to cancel each other's variability by overlap and testing on a regular basis of the state of the other. After all, since both sexes have curves of readiness one cannot know the exact state of the other in advance.

Thus a long migration together, to the lagoons, is probably optimum.

January 21, 1979

Isla Santa Margarita

Today we made a tour of Almejas Bay and the channels leading it in search of the interface between the entrance wuzzling groups and the mother-calf pair aggregation in the back bays. We set off on an absolutely glassy clear day, the sea sparkling, and scarcely a cloud. Our track took us up in the east side of lower bay above California Shoals, thence down to the Marcy Channel and in past Puerto Alcatraz and Puerto Cortes, across Almejas Bay to the north, and around the shore and back across nearly to Puerto Cortes.

We encountered our first mother-calf pairs in lower bay over near the east shallows, and then a few more in the Marcy Channel, and occasional ones when we came close to shore of northern Almejas. There was overlap since we found a group of three wuzzlers in Marcy Channel, but the occurrence of either was very scarce for the three or four miles after we initially left the entrance group. They stay largely apart, and in this huge bay can do so pretty easily. My impression and that of George, is that the mother-calf pairs seek shallows with channels where they may swim, usually far back away from open water. For instance there were no whales at all in the major open water part of Almejas Bay, only at the edges.

I sewed today and lectured (I'm giving a marine mammal series). Slow day, but we did what we set out to. Puerto Alcatraz sits on a spit and is a cannery. Boats were on the south side, including a small freighter. Puerto Cortes is just to the south and is a cluster of houses and big oil tanks and shore facilities. It's a Navy base, and purportedly a nice, friendly place where one can buy some supplies. It looks a bit bigger than San Carlos, though the dock is nowhere so impressive.

I'm beginning to get the students coming in asking for advice.

January 22, 1979

On our way to Punta Entrada, but still in Almejas Bay

I've been pondering how the decision to go a given direction is imposed on a school of animals, like say, porpoises. It has been growing that democracy of a sort reigns in such groups. While watching a bunch of cormorants alongside I could watch it work. They periodically turned as a group. One could see individuals turn, and then the school wouldn't turn, and the individual animals that turned, turned back. But then, when the school neared the end of the ship such a turner turned the rest and back they came.

So, what I see is a potentiation of a tendency to turn depending upon either exterior or interior circumstances. The potentiation may come from learned circumstances or greater or lesser stimuli from outside. Let me amplify. In porpoise schools there is a hierarchy—older animals of both sexes, apparently can be dominant, and all juveniles and young, and apparently mothers with calves are low on this ranking. So there is a gradation of leadership with several or many leaders, and leaders of different degrees of intensity. Their decisions may come from learned patterns, like "It's the time of day to go feeding," or, "we are nearing that good rest cove." But all or most of the animals in the school will also know these things and be thinking similar thoughts with greater or lesser degrees of resolve. When one animal finally reaches its own threshold, it makes whatever signal it makes; a movement, a sound, it may be ignored if the thresholds of the remainder are too low. Those who do not turn will be reinforced by the others who don't. And nobody will turn and the group will go on as before. I saw this happen in the cormorant flock. But, if many others begin to feel it is time to turn, such an intention movement or signal will have widespread agreement and the group will turn. For instance, a feeding porpoise school has surfaced and stays up long enough for respiratory equilibrium, and maybe enjoy a bit of muscular rest. Each animal will feel this, thus when a signal comes from whatever animal has reached its threshold for change, the group will dive. The synchrony of a dive cycle will help insure this. That is the intrinsic rhythm of things will help, sensed by all members, whether it be a short rhythm as in dive cycles, or a daily, or even yearly cycle.

The signal may be learned, and only the older, more experienced animals know it, but they can turn the school, aided by their station in the hierarchy of the school. Thus old animals are invested with extra power to override the whims of youth, because they have had time for learned patterns to be assembled, and thus, in a sense, the school as a whole, behaves in a learned fashion.

And, exterior events, like the proximity of a shark, may raise the level of fear of all animals, and thus the "skittishness" of the individuals and the school as a whole. That is to say each individual is on the qui vive for signals to turn, or speed up, or dive.

As fear, from whatever source, rises in the animals of a school as a whole, the animals physically come closer to each other. Signalling between animals is more sure the closer the participants. And it may change mode too. At long distance the school may use "alert" signals, such as sounds, while close up, water pressure changes, and visual cues, or low-level sounds may mediate.

Thus we see that spread schools are always made of individually alert animals. But tight schools are where the animals may be individually resting, but the school as a whole may be more alert than in spread schools. Social behavior, which can take place in the envelope of a school because the school as a whole provides protection and thus gives

a measure of freedom to the individuals in it, only occurs in spread alert schools. Social behavior is, in a sense, a luxury, only available when others are alert.

So, decision-making is a meta affair, a systemic process that in a sense involves the physiological and psychological state of its component animals, their hierarchical positions, and their learned knowledge store. The school is both a sensory and a psychic integration system.

Fear responses may come first from the timid, while ones requiring thrust may come from the bold. School fear may override the bold and the timid will rule. But under other circumstances the reverse is also true. Fear thus may reduce the boldness of the normally bold and increase the boldness of the fearful.

Do decision makers tip on the knife edge of an equilibrium? Must of this is algebraic summation. Citation at Harvard [?] for Law Degree: "Those wise restraints that make men free."

January 23, 1979

Almejas Bay, Baja California

Today is reconnaissance day for the intrepid crew of Dr. George (at the helm), Karen Miller, Jim Darling, and Ken Norris. We had a visitation yesterday of the local Capitan and two of his patrol boat skippers, from Puerto Cortez. They rather quickly cleared our papers, having a copy of them at Puerto Cortez, somewhat to our surprise. Then they came out to the ship, with a storekeeper and two coxswains in a gig. We welcomed them aboard over the Jacob's ladder, showed them the ship, and then sat them all down for a couple of cups of coffee in the saloon. I had earlier explained to the Captain that we were seca, so his requests for a tot of rum in the coffee were in jest. His name was Capitan Luis Olguin Fernandez. He was a classmate of Jorge Lagos Kuntze with whom I had visited Scammon's Lagoon early in the 1960s on the *Sea Quest*. We both found him an urbane, almost courtly and humorous man. He told us a good deal about his post, the island and a miscellany of comments. Portuguese, for instance, was Castillian badly spoken. He said there was an oasis on St. Margarita, with palms and seven wells, and a few small farms, or gardens. It was in the center of the island. He said there were a few borrego on the island but no deer. His territory went from Abreojos to Todos Santos and included patrolling to the 200-mile limit. His two young lieutenants were bright young folks, speaking some English and giving the appearance of competence. All were nicely dressed in uniform; the Captain with three stars. When they left I whistled a bit of the bo'sun's piping for piping people aboard; the Captain smiled and they took seats inside the canvas spray cover and were gone. Afterward we cruised down to the end of Almejas and anchored for the night.

Anyway, we put teams ashore to walk the beaches and to look out over Almejas Bay with the telescope to see if they could develop a count of whales while the four of us set off in the Avon for Rehusa Channel and Isla Cresciente. We had a lunch, VHF (so much better than those damn walkie talkies) hand-held, water, charts, and spare gas.

Our track took us along the shore of Santa Margarita, thence around a long sand spit and into Rehusa Channel, across to Isla Cresciente, out the channel past the sunken freighter, over the bluffs of Tosca and back in for lunch on the strand and then back again to the *Regina*, anchored regally in the bay, towering reddish mountain behind her.

January 24, 1979

Puerto Magdalena

With little ceremony we hauled the anchor this morning and headed back out toward Punta Entrada. The day was gloomy and soon began to rain in earnest. By the time we passed Puerto Alcatraz we had some fine gusts of rain sluicing on deck. I stayed below mostly, getting notes in order, snoozing and talking to Jim and Karen about this and that. Late in the day we came up in the entrance, and I went topside in the beating rain to observe for a while. The whales were in their old stand off Pt. Entrada, and waves and wind were passing through. When the tide opposes the wind here it can get very humpy very quickly, and when the tide shifts it can lay down as quickly. I climbed the foretop in my foulweather gear to watch from the pitching mast. The tape I recorded sounds like it was made under a tin roof in a rainstorm. It was too rough to see very much. But we did note one thing. The whales were very much more active than usual. Some swam rapidly enough to have bow waves. Breaching was very common; we counted 11 in half an hour, and there were a number of surface flunders in which the water was beaten white without an animal emerging enough to call it a breach.

My impression was that the waves heightened the excitement of the whales and that this was then translated into aerial behavior of one sort or another, just as it is in spinner porpoises.

Not too long afterward I came down and we headed for anchorage at Puerto Magdalena. Jim Darling leaves us tomorrow to head back to Honolulu. He plans to get a ride to San Carlos at Puerto Magdalena, and then work his way home.

January 25, 1979

Anchored inside Punta Estrada

After a brief breakfast we put Jim ashore in the rubber boat. I went in to translate and asked some fishermen who were about to launch a skiff, "Hay personas van a San Carlos ahora?" "Si, ahorita," one said, indicating that he was going up right away, and Jim merely put his gear in and left. Excellent connections for Puerto Magdalena, I'd say. It, by the way, is a neat little place—the site of an old whaling station, and later a magnesite mine and orchilla gathering plant, its old factory stands back of the manager's house. Down the strand are about two dozen houses painted all colors of the rainbow. Almost missing is white. When we anchored yesterday the rain had converted the little draws around town into muddy rivers and it was divided into six pieces by five streams. Today they were all dry. The people seem extraordinarily friendly, as is everybody in this part of Baja, it seems.

After leaving Jim we shoved off under wet sails for the entrance. Everyone was a bit loggy from lack of activity back in still Almejas Bay, and the bit of hauling on lines, overhauling buntlines, and the like did everyone good, including me. I have trouble with the inactivity of a ship, anyway.

Under sail we moved pretty slowly so it was quite a while before we reached the entrance. Once there I had hoped to anchor but George decided that would be too rough; the swell was high and the wind likewise. So we sailed about, often far from the whales, and only late in the day did we spend some time hove to in the entrance group, drifting with them. The wind had shifted to northwest and much of the day whipped by at a smart

20-25 knots or so, and when the tide was ebbing, it was opposing the incoming swells and pretty rough.

January 26, 1979

Punta Entrada

We had anchored here last night in a little nook just inside the point, out of the northwest wind, and with only a relatively little swell to rock us. We'll duck into the same place again tonight, as it seems better than Belcher Point (which is only a low sand spit jutting out, and awfully shallow for the *Regina* on the south side), and Puerto Magdalena is ten miles away, and really no better, except that if the anchor drags there one drifts out into the bay, and here one has to contend with the rocks at the point. But George is a prudent mariner, knows his ship, and about such things as currents and anchors.

Anyway, today was probably one of the more remarkable days I have had as a naturalist. I went in with one notion about what was happening, saw my ideas change in the morning, made an hypothesis at noon, and saw it confirmed essentially to the minute in the afternoon. George, too, had an hypothesis confirmed today. What we have emerged with is an idea about entrance groups, why they gather, what they do, and when.

January 27, 1979

Punta Entrada

Well, now I know what it's like to be part of a communal love experience. Today we, and the *Regina*, were communally loved by as many as four whales, and they even got a little feisty over our attentions.

It was quite an experience. The first whale circled us and then stationed under the counter, its flukes shining greenish white off the pattern and barnacles. It began to surface, mostly along the waist of the ship, aft. People were clinging to the ratlines and standing on the sides of the ship, cameras clicking. I, alone, took 4½ 36-exposure rolls. The whale came up, a huge, huge bulk, right alongside the ship. One could see every spot, every barnacle, and practically every cyamid. It blew, and three people at least confirmed the blow to be sweet and salt water. They tasted it. If it does it again we will collect the blow and analyze it.

I have vignettes in mind of Annie clinging to a line partly over the side. I stood in back of her six ft. or so, and suddenly the entire viewfinder was filled with mottled graywhale, with neither head nor tail in my view, with Annie standing in front, so obviously so small in comparison. Then the whale took a sidewise, petulant swipe with its tail toward us, stopped before hitting us or the vessel (it did it twice, I'm told)—a gesture of annoyance, perhaps at the people (I doubt it), when the affair was between whale and vessel, the great bulky mother lying there, thrumming away placidly at anchor, and the small whale (it was maybe 35 ft.) rubbing against her, exploring transducers and underwater fixtures, barnacle coatings, with little response. The boat never once extended a flipper to the visitor, or arched her tail to invite a probe in the genital area, but just lay there.

Then, four whales came in, swimming rather rapidly, I thought, as if their alertness was up, coming in this close to so strange a companion. Mostly they stood off a couple of yards and circled their bolder companion. Finally, it was we that had to break

the encounter off because darkness was coming and we wanted to pick our anchorage in the light.

The impressions were of an animal orienting to a boat, seeking to get a response from it, of petulance, curiosity, but never outright anger. Also a little fear in the other three.

Were the animals relatively newly weaned young reverting to parent-calf behavior and thus seeking to nurse, or was it sexual, or both?

January 28, 1979

Punta Entrada, Magdalena Bay

I had kind of a lousy night; all stiff and a little hyped up, I think from coffee at dinner, and I didn't sleep worth a damn—had to get up and do exercises in the middle of the night. Amazing how stiff I am. I can't touch my toes, when usually I can put palms flat. George says it's probably the two foam mattresses. I took one off and it's a lot better, I think. But, man I'm sleepy today. I finished a biography of Lidberg last night, and found he was on my Oceanic Foundation Board, forgot about that. I remember him well—glittering blue eyes, unsmiling, terribly intense, his little wife a charmer, sweet, observant, smiling. He had wanted to know about whales and knew more than I about the Peruvian take. He was a flawed human—full of mechanical skills, but naive, humorless and difficult, and very, very macho.

Anyway, today we anchored again, took various observations. The whale population had dropped in number dramatically. This is the last day of a three-day spring tide series, and the flood almost didn't stop running. We almost didn't reach slack water for some reason. I worked below, wrote, had a snooze or two and came up for various observations. Brisk, overcast, blowy weather, as it had been most of the time we've been here. Our two "friendly whales" came over again. The same ones. They didn't give us such full treatment as before but did travel around under and around us, especially astern. Both are juveniles and the behavior seems to me juvenile, like teenagers relating to Momma, only here much is sexual. The orientation aft, under the counter, around the stern post, rubbing under the curve of the vessel strikes me that way. It isn't adult love, in my view.

I gave a bull session tonight for the people who are taking a final exam. They are to construct three marine mammals out of their imaginations, evolve them, give them characteristics, etc. Most are going wholly bizarre, but our discussion did give me a chance to talk about a lot of important adaptations.

January 29, 1979

San Carlos

We did another survey this morning, and boy, are the counts down. We can't have more than 1/3 the animals that were here when we arrived. We'll see. First thing, at the anchorage at the caleta inside Entrada we took a bottom grab, and it came up sand and shell, and bluish and intermixed. This certainly supports the eddy notion. I think Belcher Point has been built by this eddy and that therefore our anchorage is in much quieter water than out in the rip.

January 30, 1979

San Carlos

After the survey was over we headed for San Carlos. I spent most of the time below getting notes in order, packing, and the like. By the time I came topside we were in the channel and beginning to dock. There were two big ships alongside the wharf—an old Liberty ship loading cotton and a school ship of maritime students in Mexico that was loading ammonia from a local fertilizer plant. The Muelle was stacked with thousands of bales of cotton from the Villa Constitution area.

There was a little sortie ashore, for beer and camarones but I was so full, already, of dinner that it was more a burden than a pleasure.

To bed.

January 31, 1979

Bernd Wursig arrived today in a nice VW van that will allow us to take all the earthwatchers to La Paz, along with me and my gear. I spent quite a lot of time introducing Bernd around and orienting him to the work. The ship will go up into Devil's Bend, and with a bit of luck we should get some interesting data on spacing and nursing.

We engaged the local Miracion man in battle today and he thoroughly got his back up. It stemmed from Jim Darling's not checking in (we didn't ask him to) at San Carlos. Many things were found wrong with our papers, and renewals were impossible from here. George had to go to La Paz, it eventually turned out. What a damn nuisance since we knew this guy could do it, and had been told elsewhere he would. But I know we were wrong at the start and our language of apology insufficient and then George has a stiffness about him engendered in part from being a Yankee and in part from the confined life on a ship where one tends to slam the door shut on invasions of various sorts. Nonetheless George was the soul of patience with the man, and agreed to everything even though he must have been seething internally. So, he has to go off to La Paz to do what this man could do here, and no phone messages will suffice. He must pay penance. Later, the migracion man relented, and gave George his extensions here. We think he talked to Armas the Port Captain, who is a friend of ours, and knows we are not your typical arrogant gringo. At any rate, all problems evaporated.

A grand party ensued, with much singing on deck, etc. that went on for hours, leaving me with a bit of a rum hangover next day, but not too bad. I was only one of several, and not making excessive noise, but just singing good ole songs.

Many goodbyes, warmth from Annie and George and invitations to come back with a new program, many students with aspirations to do work like we did. Many had seen me and we had talked careers and schools and the like. Some will stand a chance, and some just don't have it. Most are going through both socialization and intellectual growth, and the two typically interfere. I saw family problems, people with hard-driving fathers in the way, people from the medical profession where so much can become so inhumane at times, and so on.

Anyway, amidst all this we cast off in the VW and had a nice drive to La Paz, where some left on the plane and Ellen Margulis and I who go out tomorrow holed up in the Perla for the night. My room had no hot water, but hers was apparently closer to the water heater and she gave me reports of hot showers. I went back and left my own water running for about 20 minutes and it too came hot, though La Paz's water supply declined 1/3 in the process. I recouped my snoozing, she circulated the town, a dinner, and more

snoozing for me anyway. Then, off to the airport for the flight home. I'm more than ready to be there. The trip was productive, hard work at times, and an interlude where I made a recovery of sorts from the pressures back at UCSC, and especially was able to do some honest consecutive science, which seems so hard to do in the face of other pressures.

Northern Gulf of California: March 2-10, 1979

March 2, 1979

San Felipe Harbor, Baja California Norte

The usual hassle has been traversed (not that other hassles may not lay ahead). The hassle I speak of is the border hassle. Bernd Wursig and Randy Wells towed the *Naia* down to Calexico in fine shape while I went to San Diego to pick up insurance, change money, and then I went across to Tijuana in a rainstorm, located Ben Lopez's house up on a terrace above Tijuana valley. That was not so easy. He said Londres Street and I found it, a deep ravine full of boulders, rushing waters, and [?] tracks. There were numbers on the houses, stilted to the steep banks in utter and insolent defiance of gravity. One said "Londres" clear as day, so down I went and never could find the number, as I dodged, slid, bounced, jounced, banged, and sluiced down the road, never knowing if I was going to make it. I made a great circle and finally found a little side branch with 447 on it . . . a neat house set amongst carefully trimmed trees and shrubs, and a rather formal entrance. Inside was rococo—high-backed, gilt chairs, marble fireplace, the only bathroom I've seen in which the bathroom, in addition to having gold fixtures, had the roof tiled. I met Benjamin Lopez, a handsome young man, now enrolled at U. Baja California at Esenada, and steered by Anelio Aguayo, who teaches there, toward a thesis on the Gulf of California harbor porpoise. He will accompany us. His mother and brother came in, and we sat down to lunch—beefsteak, clear soup, vegetables. Their father came in, a merchant here for 40 years—a dapper kind-faced man, obviously proud of son and house. We chatted and then left to drive over the Rumarosa—the grade that crosses the Sierra Juarez. Up by El Condor, near the crest it began to snow—big wet flakes that did not last on the ground. Ben had never seen snow before. Then down the old Cantu grade we went—a winding but good road. The Laguna Salada gleamed white below as we spiralled down under the clouds. I recalled for Ben old trips there, Manuel Demara leading us to his spring, coyotes circling my sleeping bag at one spring, and the hot spring.

Soon we were in Mexicali with all its traffic and bustle. Then the border in the rain.

I tried to reach the US side to see if we have any messages. One lane and traffic forced me to cross and Benjamin was scraped off, since he had no papers. I left him standing in the drizzle and went through. Finally I was able to park and sauntered over to the working agents at the border, to be greeted by greatest suspicion by the supervisor, who looked down his nose at me and said they discouraged such things as notes and contacts, but if one came in he would know and nothing had come in. I circled over to the Mexico side to find Ben, and did. Then I was greeted by Bernd who came joyfully out of the rain, saying they had been at the border since noon and he repeatedly left messages, the last about 20 minutes before we arrived. Damn those lying so and sos at the border.

We could have waited for hours. Bernd led us down through a lot of construction mud to a marshalling yard where the truck and boat were parked. Their trip down had been smooth and uneventful. The truck, however, was parked in a sort of pit in which the dust had turned to a sort of hybrid glue-grease in the rain. In short, the truck couldn't pull it out. I was ready to sack out for the night but my colleagues, who had been standing around the border since noon were filled with pizzazz and voted to try an extrication. About four hours later we made it, but first we pulled with the truck, the come-along, and the cable around a telephone pole for a better angle (which it threatened to cut in two). Finally with the come-along and cable clove-hitched to the phone we got the incredibly heavy *Naia* over the curb and then a straight shot by the truck pulled it nearly up to pavement—but not before the cable snapped, and Ben stopped the backward roll down a muddy road with a chock—just in the nick of time. It might have gained speed and crashed. Whew!

About 11 PM we hauled happily out of Mexicali and onto the San Felipe road. Finally about 1 AM I called a halt and we went off on a road for equipment for a gravel depot and quickly went to sleep.

March 2, 1979

Next morning, Bernd broke out some corn flakes, heated up a little water for coffee. Afterward we headed for San Felipe. Lupines lined the road—a magenta variety with occasional clumps of white ones—I suppose a mutant albino frequency phenomenon. *Encelia* was in bloom as was ocotillo.

At San Felipe we encountered the new town—about 5x my remembrance of it, then drove south to Club de Pesca where Trish Holt's (my secretary) mom and dad live. They were hospitable, feeding us dinner, and many margaritas. We launched at Rubens, the north end of town. We were towed out by a spastic old big-wheeled power wagon, but Randy was ready, started quickly, and was off through chopping seas to the new harbor south of town. Ben and I drove down and met them.

Later we clambered down the jetty boulders and to the waiting rubber dinghy. On board not long after we stretched out and slept. My space was the afterdeck, on a new backpack mattress. I slept hard.

March 3, 1979

Isla Montague

After a little rigging of this and that we left on a flat calm sea that never deserted us all day, except for a few light breezes in early afternoon. Our trek took us up the west side of the Gulf to Montague Island at the mouth of the Rio Hardy. We hoped to see *Phocoena* but didn't. Only 15 groups of *Tursiops* and two sea lion sightings graced the day. Most bottlenose were with otter trawlers, or fairly nearby, though we did see our biggest group by a channel drop off S. of Montague Island, and no boats very nearby.

The Gulf shallowed and finally about 4 PM we could go no further for lack of draft. The water was clouded with birds at times—mostly Heerman's and California gulls. Surf scoters were common—not a few Western grebes were seen, one jaeger and a few terns.

Right now I'm sitting in the helmsman's seat watching a magnificent Gulf sunset over the Sierra Juarez, and listening to tern cries and other birds over on the mudbank of

Montague. We are anchored at the southern mudspit in calm water. My fish line baited with elegantly odoriferous shrimp has yielded ziltch so far.

The *Naia* has done splendidly. On one engine she made the trip on about ¼ tank (70 miles), our chart table is great, our footrail greater, and I scrubbed everything down so she's pretty clean, too. Company's fine and detailed notes on porp sightings are in the Field Log book.

March 4, 1979

San Felipe Harbor

Sometime after midnight I awoke realizing that we were anchored where Francisco Ulloa (in 1510 or thereabouts) had a boat upset in the tidal bore, and later a Colorado River steamer capsized, killing more than 100 people.

I tossed a crumpled paper in and the tide still seemed to be going out. I could hear rushing and burbling water off toward the mudbanks. I began to worry a little about a bore of some unknown size and force though I knew we were past the spring tide and also that decrease in the flow of the Colorado River had drastically reduced the chance of such phenomena. Nonetheless I went below and shook Randy. He thought we should move. Soon Bernd was up and then Ben. Then, Randy pointed out a south course which looked north to me. I checked with Polaris and he was right. The tide was coming in. Even though by this time the anchor was up and the raft on the roof, I consulted Randy again. Better to anchor here than go off into unknown water he said. So, since the tide had shifted two hours before, we dropped anchor again and secured. So much for tidal bore drill. Back to sleep.

Montague Island rises dark brown with wetting from the tides, a long, rounded 30-ft. high mud mound, incised with runback channels where the tidal waters drain back. No features stand out. Only at night can one see the cluster of lights at El Golfo (Sta. Clara) or see headlights jouncing along the higher Sonoran bluff, as some unknown car makes its way along the rim of the Gran Desierto. Coffee-colored water merges with low tidal bluffs—only occasional tufts of saltbush relieve the monotonous landscape. Winds whistle in, unimpeded. This morning a short chop had built up from the 10 kt. wind.

Bottlenose porpoises puffed astern of us in the dark, the inspiration and expiration clearly separated—a 0.5 second expiration followed by a higher pitched and shorter inspiration. Does the change of pitch come from different velocities of air passage. I'll bet it does. But one would have to calibrate his porpoise to use it as a measure.

The trip down was uneventful except for a few encounters with *Tursiops* groups, a couple of jaegers, and much conversation of this and that. Randy's pole and nice reel, alas, went over the stern on an improperly set pole holder.

The *Naia* wallows in a following sea so we spent the day correcting course. We travelled on one engine, making seven knots or so, and made the roundtrip on less than ½ a tank of gas (50 gallons). Brown boobies became common as we approached San Felipe, and the water cleared a bit, but not much else happened. At San Felipe we loaded fuel. I designed a field camp for Hawaii (an assembleable house) [drawing] and later, cooked dinner, went shopping with Ben, and helped with rowing and so forth. Tomorrow we check with the Port Captain and then head for Puerto Penasco, and Roca Consaga along the way, there to count sea lions.

Good crew, good day, but no . . .

Today was Sunday and it proved impossible to phone home. The town phone was broken and the phone office was closed (it's Sunday). Nonetheless we obtained some supplies—fruit, bread, alcohol for the stove (pure cana, used to make vodka or dilute wine) obtained at the liquor store, “48 pesos por litro”), bananas, cabbage, mayo, and we try to see the port captain—no luck. To bed on board at the harbor.

March 5, 1979

Sonora, at anchor just outside Puerto Penasco

First thing this morning Ben and I headed for town to talk to the Capitan del Puerto and to call home. The Capitan was pleasant and pecked out a long document about motor numbers, captains (Randy), and destinations. Ben later said he was pretty bureaucratic and more or less asked for a bit of propina—100 pesos in this case. My call home showed Jessie better (a bit) and all well. Gasoline, carried in 15-gallon carboys took time to ferry, siphon, and buy. But in mid-afternoon we were ready and the wind had dropped a bit. I wanted to leave to keep on some semblance of a schedule, so off we went, planning to stay the night near Roca Consaga. The *Naia* bounced and [?] her way the whole 19 miles. She doesn't steer very well in a following or quartering sea. Anyway, toward dusk we pulled up on this sail-like rock. From any angle, it looks like a huge sailing vessel, with high schooner-type sails, all white with guano for whitening.

When we reached the rock, tidal currents ripped around her from the north, leaving lines on either side of roughened water.

The fathometer chromalled a steeply rising rocky bottom and no shelf at all where one could hope to anchor.

I asked Randy to circumnavigate the rock so I could count sea lions. In the late afternoon light and in choppy seas I made an estimation. On the main rock sea lions were around all sides. On the steepest slopes where cliffs slanted 80 degrees into the sea these pinnipeds were fewest. On the north rocky shore and a cobble spit to the west they were so thick as to touch in a solid carpet of sea lions most places. Groups of young juveniles barked in the water. On the western rocky outliers I saw only one, an old bull atop a 15-ft. stack. 326 sea lions were counted, no very young, but half-grown females and [?] males.

The rock itself is a precipitous fin or pyramid, the top a steep, fissured, and triangular pinnacle. Some faces are 80 degree faces, dotted at our passage with young brown boobies clinging to tiny ledges over it, while adult birds wheeled in a loose cloud around and over the pinnacle.

Both Randy and I immediately saw the hopelessness of anchoring and decided to head for Puerto Penasco, 40 miles distant. The idea of a nice navigation by compass exhilarated me. It is, as Randy points out, a simplifying experience. The world closes around in the dark to the compass, the rocking boat with all its sounds, and ultimately a light on the horizon, or a passing otter trawler.

Ben and Bernd, however, weren't up to snuff and went to bed so Randy and I took her in, and anchored outside the jetty at 1 AM. To bed.

March 5 [6?], 1979

Isla San Jorge, Sonora, Mexico

We anchored not far off the main channel into the harbor and were rocked by passing boats before we were up.

After pancakes, Randy took us in to search for gas. It proved to be fairly close near the south jetty. Ferrying worked OK though the little inflatable is pretty unstable. On one such trip I stayed aboard and not long after everyone left the trawler to whom we had a bow line secured threatening to back out, in fact from the snapping line and groaning cleat (which I thought would come out by the roots) I thought departure was in progress. My calls finally roused a deckhand and he said, yes, they were leaving. I told him we were tied to the bow. Then I learned they would be there two hours but then, in spite of asking to leave us tied, over came the line into the water. In moments, it seemed, we were drifting in. I tried to get the engine down and couldn't and then we drifted into some skiffs and lines. I tried to take the anchor up and row it out, and while in a snarl up came Randy to help and together we did get the *Naia* out but not before she dragged bottom, brought up an old tire on her outdrive and various other problems.

Gas, papers, etc. were finally completed with me forgoing Randy's name, as skipper, six times.

At sea we headed south toward Desemboque and Isla San Jorge. The coast is low alluvial plains rising to low hills some miles inland. An unbroken beach stretches a dozen miles back into Bahia San Jorge, almost due East. A 10-15 kt. NW wind kicked up a little swell but sailing was good. Finally when we were due N. of Isla San Jorge we turned out to sea and toward the island, 10 miles offshore.

Enroute various groups of *Tursiops* were seen, mostly in company with trawlers. One particularly large group—actually two of more-or-less 20 animals each visited us. They were heavily parasitized by *Xeobalanus*, especially on the rear end of the dorsal fin tip. Some had them on rear fluke margins and trailing edge of pectorals. Many had multiple barnacles of this sort in clusters.

I noted that when porps rise to breathe, they pause and glide up with flukes horizontal, breathe, arch the body, and beat the tail again. There is a definite hitch in their swimming. I wanted to see if I could discover any difference between the power of up and down stroke of the flukes. Purves, I believe, feels the downstroke is the powerstroke. If this happens the powerstroke should be quieter than the passive stroke. I couldn't see a difference in the time of up or downstrokes. They seem the same. Randy notes that whale and porpoise "fooprints" well up and out, indicating a power upstroke. I note that our fast swimming animal turned on its side and achieved power probably in both directions since the pressure exerted upward loses power and an animal on its side doesn't face this. I doubt that there is a difference.

At dusk we came in along the north side of Isla San Jorge. It's covered with brown boobies and has a compliment of barking sea lions. The island is a jagged, guano-covered fin that reaches about 250 ft. high on the south Islet. There is very little vegetation, the guano having buried most everything. The anchorage is a fairly good one though wind whistles through gaps and rocks us.

But if we drag anchor we drift out to sea. So, dinner, notes, and to bed. Oh yes, and I noted the *Tursiops* craning their necks a la *T. truncatus* . . . that is, turning them at 60-70 degrees to the side as they swim along, usually to peer at us, or something. *T. gilli* doesn't seem to do this.

Our anchorage was a blustery but OK one.

March 6 1979

Enroute, Desemboque

We made a count around the island first thing in the morning after I had caught lunch of *Paralabra nebulifer* (sand bass). Sea lions were distributed all around Isla San Jorge, which is perhaps 1/3 mile long. All age classes were present, many individuals had climbed high on the guano-covered cliffs, and there were several pockets with hundreds of animals piled all on top of one another. Bernd and I both counted and came up with counts as follows: Norris 2,274; Wursig 1,806. We can conclude that about 2,000 animals occupy its shores at this time of year. Such counts are rough with animals piled over one another and hidden in nooks and are apt to be low. Several species of birds were noted—nesting brown boobies spaced over the entire island mostly up on rubble and steep faces of rock.

We saw a few Heerman's gulls and California gulls on low cobble stringer, near the tide line. I saw a lone oyster catcher and a lone great blue heron, one group of a dozen or so frigate birds with red male throat pouches in evidence, a couple of kinds of cormorants, and pelicans in breeding color. One could see on the slopes where guano collectors had built trails, often with rock work supports in steep slide areas. No one was in occupancy and only a lone shack, its corrugated iron all but blown away, remained.

We left San Jorge shining that special tangerine shade of the Gulf light—in this case light because of the guano covering the island. On down the Gulf we went, the seas quite calm, almost glassy about noon and then picking up a bit in the 8-10 kt NW breeze. We cruised the shore, close enough to watch the beach as well as offshore. Only a few groups of *Tursiops* were seen at sea, and we saw five carcasses on the beach and rowed through the towering surf (six inches) to prove it. There was a skinned *Zalophus* and *Tursiops* and two *Delphinus* north of Desemboque. The latter may be a northern record for *Delphinus* in the Gulf, at least it's pretty far north for them.

The shore is a long strand, often topped with sand hills, and behind the bajada is a low sandy plain punctuated here and there with barren ridges of rock. Most are low but some are 3-4,000 ft. high.

Jellyfish were very common, of a single kind, sea blue in color with a very short funnel stalk protruding veined with pellucid fins that I assume can be turned to alter the direction of the jellyfish [drawing]. Certainly they were maneuverable and moved very rapidly for a jellyfish. One evaded Randy for a time when he tried to scoop it up in a bucket.

A long V of white pelicans flew north from the shore above Desemboque undulating over imaginary (or at least invisible) barriers in the air. Their slow, almost ponderous, wingbeat and large size set them apart from other birds, as did their immaculate black and white plumage.

March 7, 1979

At Anchor S. of Desemboque

Finally we located the mouth of the Rio Concepcion. It wasn't simple to see. A shallow, muddy area lies in front, out to sea. The shores are lined with stumps that have washed down the River. Ashore I could see an arroyo, the south bank cut with a braided channel, now nearly dry. Back beyond the beach bar I could see casuarina trees, the roof

of a quonset hut and thickets of desert willow (*Chilopsis*). To the north a few hundred meters was a cluster of houses on the beach berm, a gaggle of gill net boats and a number of people. I suspect this is the sea entry for the town.

Gill netting is still fairly intense in the upper Gulf though done entirely, so far as I could see, from open 25-ft. boats. We saw many of the nets set relatively close to shore as we travelled along. They were mostly flagged and set parallel to shore. What species they seek I do not know but the nets are relatively small mesh nylon—probably milled.

Bernd and I went ashore to look for *Uma notata cowlesi* and found it on the beach dunes just at sunset. I scooped one out of the sand where it had buried. Later we found a *Delphinus* and three *Tursiops* skulls in the beach wrack. No *Phocoena*, darn it.

Back on board, dinner, a spaceman's toddy (rum, sugar, water, and Tang), and dinner. We're fairly comfortable in a low swell coming in from the SW—actually we swung in the incoming tide and the swell continued to come from the NW. It was a wet night though the gnats blissfully enough retired at sunset.

It's a flat, rather featureless world here. All the relief is in the distance. We can see Angel de la Guarda Island in the distance to the southwest. I can make out Isla Mejia and where Puerto Refugio must be, and then inland to the east, those isolated Sonoran mountains.

I stayed on board this morning while Randy, Bernd, and Ben went ashore to look for *Phocoena* skulls. I spent my time scrubbing decks and cleaning the galley. They came back with a *Tursiops* skull.

We interviewed a couple of gill net fishermen who came alongside—boys really. They knew the chochito, and confirmed it had a snout and knew toninas, but they knew nothing of the vaquita and suggested that it might be a local name in Baja—maybe they are right. They fish for sharks—smoothhounds and said they caught as much as a ton a night.

When the shore party returned we gassed up and headed out on calm seas to the northwest. Last night had been one of wet decks and drips, soggy pillows and bags but withall dry enough inside for continuous dreams of this and that, of a garden belonging to a Mr. Rat who spoke the king's English and had subdivided his formal garden, where my car was parked, into districts—"Rosario, San Felipe . . . etc.," each connected by a gate to the outside. A remarkable contraption of levers stood at each division and off to one side an instrumentation panel. I read it and tried to operate San Felipe gate to no avail. The Rat came by and curtly informed me I was in "Rosario" and so I was ultimately released. Now what was that all about? The *Socialista*? I suppose, with an anchor foreward dragging as the *Socialista* nearly pulled the cleat off the stern.

There was also a colloquy about the Rat insolently informing me that of his two gold medals, as if I, serf, could never aspire so high, but I showed him some paper or other and we were again equals. I hesitate even to interpret this.

The *Naiia*'s a little tight for four. With the walkway (which works wonderfully well [?]) the foredeck area is available in inclement weather. Sleeping at night is a worse problem. There is so much gear there's scarcely space foreward and our crew seems not to relish such sardining. The bunk made by the table is the best in the house but also scarcely fits two. The afterdeck is ok when it's dry but with dew it's very wet, even under cover up by the helm. The solution is three[?], or more intimacy, or waterproofing aft. But all in all, we are doing fine, and are a good happy crew, full of jokes and songs and

poems (Bernd knows a lot of Hillaire Belloc's verses, amongst others). We kid Randy about fiddling with his "inflatable dinghy" and other bits of naval folklore in-the-making.

Random thoughts—seafarers must always have known the earth was round for they are confronted with the fact a dozen times a day. Each time a point of land or an island rises into view or a light breaks the horizon and rises as one approaches tells that story.

Right now for example, we can see the crest of La Providencia, the highest peak in Baja, nearly 12,000 ft. tall, and to us it is a low prominence of land not so tall as Isla San Jorge [?] our beam and 240 ft. tall. If porpoises talk might it not be that an entire school talks at once and that brain is devoted to making sense of the din. Our puny neural apparatus, used to one person *tete-a-tetes*, and boggled by cocktail parties, might make no sense at all of what may be a sort of "group speak." I'd guess such conversations would be incredibly banal, and instead of being devoted to timeless truths worthy of being said across interspecies barriers, they have only to do with relationships between porpoises. After all, that's where the communicants spend their lives.

The Sierra Pinacate has been a beacon all this trip, its double-tipped shield rising up to the north behind Punta Penasco. What interesting times I have spent in that mystical place. The sawtooth Hornida Range rising out of the sand to the west was too low for us to see but next we traveled up along the margin of the Gran Desierto to Santa Clara and maybe then.

This afternoon both south of San Jorge and Punta Penasco we encountered *Delphinus*—the farthest up the Gulf I know of them occurring. It clouded over but stayed calm on our 65-mile northwestward trek, which could have been miserable.

The *Delphinus* near San Jorge were feeding and generally avoided us. On one occasion about 50 animals came toward us in a slanted rank, and I cut the engine to wait. One could hear the rush of water along their collective bodies. As in other porpoise groups I saw ones with primarily adults and others with many young including very small animals. The other school Ben spotted in the dark just S. of Punta Penasco.

Tonight, courtesy of the Captain (Mr. Wells), who, bless his soul, I have a veritable palace on the stern. The canvas cover is up! I do not have to creep under the helm seat where I bang my head. I do not have to bend my body in the middle to take advantage of the companionway, which is the driest of the deck aft.

Our captain is a fine member of his breed, if I can include him with them. Randy knows a lot of seamanship and has excellent judgment. Best of all he is always thinking ahead, and that, to me, is the mark of a real seaman. Old Frank Brocato had that attribute in spades. Anyway, things go well with Randy in charge and we really let him make the decisions so that he can function—that being a real trap for a situation such as this where I have ultimate charge but must build a functioning team to work both when I'm here and when I'm absent. Randy amply fills the bill.

Ben is quiet, probably because of some degree of language barrier (we academics, particularly those who joke, use complicated language play on words, make esoteric inferences and references. But, Ben bears up and is gentlemanly. A thread of intensity shows now and then and he is very affable and helpful when we let him. With four people there's not all that much to do. We're having him fill out data sheets and go on beach walks and such.

Bernd is a joy, very, very competent, full of vivacity, humor, always ready for more, never ready to quit, a blithe spirit anxious to be a good shipmate.

March 9, 1979

Anchored in 3 ft. off coast 20 m. SE of Santa Clara, Sonora, Mexico

Today was a triumph of officialdom, though ultimately we escaped their uncaring clutches. We started at 6:30 with breakfast, then gassing which involved rowing ashore, toting 15-gallon plastic gas drums to the Pemex station three blocks up the hill, hailing cabs to drive it back to the ramp. The ramp, by the way, was where the gill net skiffs brought their catch in and the trucks backed wheels below water, to pick it up. I bought a nice halibut for dinner, by the way.

Then we attacked the Capitan del Puerto and quickly were sent off for four copies of our permit (five pesos a page at the local sporting goods store). The Capitan was pleasant enough but one of his type as you could tell three blocks away—unsmiling, a little moustache, about 40, a little flabby, not a working man, drives a spiffy car. He sent us to see the Inspector de Pesca, for a stamp and initials. That took half the afternoon as he didn't show and finally one of his secretaries took my papers and disappeared by car to return half an hour later with the stamps and initials. I suspect him of being holed up in some motel, but then my thoughts were oriented blackly. Finally, Ben and I bought bread and groceries and went aboard and we escaped the harbor at 1355. Whew!

We interrogated various fishermen and no one at Penasco talks about the vaquita. They know the chochita, and speak of it having a snout, and they know the tonina. But vaquita, no. But folks at San Felipe knew, especially one fisherman interviewed by Bernd who identified it very well without prompting, talked of three kinds. We had some unconvincing discussion today of our animal to the south at the midriff, LA Bay, and Guaymas. But here, it is either rare or doesn't come in now, it seems.

We headed out across Bahia Adair, the great bulk of Sierra Pinacate looming to the east and the bay stretching off to low shores backed in some places by strings of dune mountains. There were very few birds and very little life in general. We did see a red-billed tropic bird flying overhead. Finally we closed on the far shore—a low sedimentary bluff at the north end of Bahia Adair. After watching a spectacular carmine sunset with shafts of sun piercing the clouds and a kind of luminescent aura radiating over the land, we dropped anchor in three fathoms about $\frac{3}{4}$ mile offshore with a SW swell coming in enough to rock and slap us.

I cooked the halibut, we drank a ceremonial bottle of [?] de Jerez (Santo Tomas), with crackers and much conversation. About this time Ben faded out from a bit of seasickness while we ate till our bellies distended and our eyes bugged out. Good though.

Well tomorrow, a short run up the coast and thence back across the Gulf to San Felipe and then home while these devils continue their idyll on down to the midriff.

March 10, 1979

San Felipe

The swell banged at us all night, a mean little SE swell copping at us from the direction of Puerto Penasco. Everything slapped and banged—the rubber raft astern, the water under the chines, doors, pots, and I sluiced back and forth in the roll inside my sleeping bag, trying to sleep. I did doze off and in between got up to peer at the sea under

the flaps. There wasn't much wind, but we were in three fathoms (minus tide) and the wind, such as it was, had no fetch, so we banged.

No danger though, except that it might pick up and we had no real place to go from a SE swell. But it didn't.

In the morning, we rose before the sun peeked over the desert to the east, illuminating the Sierra Pinacate. I suggested breakfast would be easier if we got underway, so we hauled anchor and headed off along the coast, finding we were actually inside Bahia Adair, and had some distance to go to reach the western cape. Finally we did, after cruising through calmer seas and watching the terns dive. There were large numbers of Forster's terns, and what we think were gull-billed terns. The latter are supposed mostly to hawk for insects, but ours were diving. I dunno.

Finally we could see just the tip of Montague Island ahead and a little village of shacks on our beam so I changed course for San Felipe, as I have a long drive ahead of me. Almost immediately we ran into a good big school (100-plus animals) of *Delphinus*, feeding in small groups across a pretty wide stretch of sea. There were all age classes from very tiny young to adults. I noted a good many with the whitish flush in the center of the dorsal fin, a triangle of whitish that I've seen many times on the outer coast and wondered if it was a population marker. Now I wonder if it is age-related, and found only in large adults.

North of Consage Rock we began to see what we think were pretty sure *Phocoena sinus*. They were elusive in the extreme, but by this time the sea had turned glassy and we could see a long way. The animals were very small—five ft. or less, and often very close together. In all but one case their fins seemed fairly tall and gave the appearance of being falcate. When the animals dove they tended to come up in other than a straight line. They were in pairs and I think we saw about four such pairs the last being about five miles off San Felipe. One one occasion we saw the blunt snout twice, and I could make out the hitch in the swimming in which as the animal rolls it takes a hitch forward as by a strong tail stroke. Typical of *Phocoena* elsewhere.

Later we did see a small group of *Delphinus*, and they were notably different, breaking water, and finally coming over to the boat. I once saw what appeared to be a fairly low, triangular fin on the *Phocoena*. All in all, I'm essentially convinced we were seeing *Phocoena*, though because we never approached closer than about 100 yards our data do not firmly stand up in court.

At the same locus, in a slick area, we came across three or four minke whales—not very big ones but clearly minkes, with the fairly large fin, small size, and lateral pattern marks. I'd guess the biggest at about 25 ft.

Then we went in, landing in front of Bud and Helen Neal's place, and wading ashore across the flat. They were gone, so after some searching I went out for a meal and then settled down in their living room. Finally they came in and we had coffee, said our goodbyes, and I was off. I drove straight through to Indio, slept in a turning circle in an uncompleted country club, and then over Cajon Pass, up 395, across Tehachapi pass, over to Paso Robles, and home. A long drive, but glad to be back. The boat should be well on its way south on the midriff cruise by now. I think it should be a marvelous cruise and I envy those guys doing it.

Tuolumne County, May 18, 1979

May 18, 1979

Tuolumne County, Camp 3 miles upstream from Early Intake

Larry's and my journeys with you are at an end. I lie here on the pine-needle-strewn sand looking up past three ponderosa spires to a domed and scaling granite giant across the stream. Wind flickers the alders and the sun glints and runs along the stream surface telling of a powerful current. Tomorrow we will gather our gear, swing our now light pack frames onto our backs and head for the blue bus. Then we will go home to other streams of life and other styles of doing things, but I hope some of what we have seen and done will stay with each of us.

There's much love here, of the caring kind, and maybe if we knew how it came to be we might recreate it at various other places and times. It grew, I think, in part because we 25 found places and times to let ourselves unfold, each at our own pace, away from the tug and haul of modern life, and we've come to trust one another in this relatively simple and enclosed world. Trust, that's it. That and its permutations, of tolerance for the paces, foibles, and needs of others. Our little world has been simple enough that we could attend to such things.

How else could we have been as silly as we have been? Mostly, the child in all of us lies boxed and hidden beneath social forms that we cannot drop easily—the cost is too great and too many faceless people would disapprove.

How could we afford to embrace one another, man and woman alike, in camaraderie, if it were not for trust in our little world?

Released in each of us in this way is the chance to unfold, to reveal, and to learn. No sham has blocked awe. No sham has blocked the child's curiosity, and no sham has blocked our mutual and deep desire to know how we might fit into the interlocking warp and woof of life that clothes the earth.

It's easy to mock a person for asking a question as profound as that, yet to us, in the alchemy of these times together, such discourse has become as natural as amber dawn's light on the mountainside.

We've talked a lot about seeing, perceiving in nature, and yet I think that some of the constructs I have presented have been more landmarks of my own history as an unfolding human being, and a naturalist, than something universal. They were some of my few windows to the world, in a house made mostly of glass. For instance, I remember with great clarity the first time, I combined notebook and direct observation. It was atop Mount Pinos, under the gentle eye of a great naturalist, George Bartholomew, and I watched a nuthatch drinking from a faucet and climbing a tree trunk. For the first time I tested the iteration of small hypotheses winnowing and refining ideas and observations. And my eyes were wide because I had seen so much I had never seen before, or even suspected was there. And I told you of my excitement in defining the lizard's world using David Gates's marvelous little book *Energy Exchange in the Biosphere*. From that came the clear understanding that the boundary of our bodies is the most evanescent of barriers, and we are linked, like every other living thing, to the physical world.

But in all this I do believe that one cannot really see if the internal ego predominates, and I do think guided curiosity unlocks and reveals many, but not all things.

More recently in my history, on these natural history trips, as a matter of fact, I've come to know that quite visceral feelings count profoundly too. Beauty engages our kinship with the wild world. The sough of wind in the treetops and the lonely owl's call, the cold creek on our skins—these are windows, too. We must feel with our senses and care with our deepest being to truly spur our curiosity about how things work or we could not engage ourselves with these trappings of notebooks, hand lenses, and India ink.

Seeing the intricacy of life in this canyon, sensing its quiet perfection, we are apt to denigrate our own chaotic human constructs of cities, laws, relations to the land—yet I believe they are one. Those extremes are merely processes near or far from equilibrium—the laws are the same. Yet, what none of us can yet do is simply to be of this canyon world, or of the desert, or of the river. Our beings are too much in evolution for that. But I'm not sure it makes me unhappy. I savor the engagement, the hope and the mystery of changes as great as these, in which every aspect of our lives is being reassessed, and given birth again. What a time to be alive! And, what a time to quest together.

What have these times meant to me? In the collective sense, everything. I've had the rare chance to drink at two wellsprings of understanding—my own, stemming from my experiences and mullings during wide wanderings; and yours, where I can draw from your fresh wonder, strengths, hopes, and timidities, and especially from your new perspectives of the world as it is and will become under your hands and those who follow.

We've shared a lot. We've felt puny at the base of those awesome monoliths of granite, and yet we knew that they too, in mountain time, will tumble and dissolve, like sugar cubes in tea. We've listened with all 14 danger points to a mountain sing. We've run for the blue tarp together up on Villa Creek when the mist sifted down, and we've viewed, and even spoken to the most magnificent Dr. Van Den Burgh I've ever encountered, and then heard him sing. We've had fashion shows on the gravel banks of the Matolle, and stomped the old bus almost to a pile of spare parts while Fran's family looked on in disbelief, following our ice cream binge. And we've shared our times and insights with some of the most talented and marvelous colleagues a person could have: Dan Warrick, Stephanie Kaza, Jim Pepper, Roger Samuelsen, and now Craig Schindler.

To you all, Larry's and my fondest and deepest feelings of camaraderie, gratitude, hope, and love.

(The reading of which is to be followed by a second ice cream binge in Sonora, in honor of Pamela's 22nd.)

April 13-16, 1979	Granite Mountains
April 21-28, 1979	Mattole River
May 16-19, 1979	Tuolumne River
August 2-September 13, 1979	Kealake'akua Bay, Hawaii
March 25-29, 1980	Mojave Desert
April 7-13, 1980	Granite Mountains
May 6, 1980	Big Creek
May 17-18, 1980	Matolle River
June 5-8, 1980	Tuolumne River
August 11-September 1, 1980	Kealake'akua Bay, Hawaii

April 13-16, 1979—Granite Mountains

April 13, 1979

Bunny Club, Granite Mts., San Bernardino County

It's a fairly warm night in the Granites and I suspect we will have a warm day tomorrow. We're arrived with the class of '79 Natural History of California in the old blue bus. Good group, appreciative, expectant, dedicated, a lot of joy, learning to know each other. We had a delicious [?] and apple sauce for dinner.

The full moon rose, amber and huge over the Old Womans, and now rides high, smaller, shining white and cold. Stars shine against the granite monoliths above the cabin. Toads trill in the moonlight down in the wash, short bursts interspersed with silence. The air is still and the voices of singers and guitars float off the porch. Our windows are open and a fire gleams in the hearth and Dan Warrick stirs it. The gear lies about in heaped disarray but no one minds. People are perched on rocks and the porch, bunks, writing notes.

Tomorrow I start a round of observation studies . . . , always a hard-working and rewarding day. I'm mildly weary, finding it hard to break away from the routines on campus.

April 14, 1979

GMBC

Today was observation day for me. I took four groups on the little walk to the pond and back, laid my assorted prejudices on people, and then watched various beasts—butterflies possibly drinking from the moist sand at the pond edge, water striders, fringillid flight, toad swimming. The latter was the most successful, surprisingly enough. We could see it easily and we could prod our charges back into locomotion whenever we wished. I was amazed to see the proguinal leg segment held nearly at right angles to the body in the swimming stroke with the lower leg and foot doing most of the movement. I made a fairly complete description of the patterns in my species accounts. The bird flight was not very satisfactory. We couldn't see it over and over and I couldn't seem to keep people from looking at other things, but the others were good. The little walks added, too, I think, though, this group is so skilled that much of what I know was old hat. But by being socratic one can draw information out to add to the group experience.

Back at camp, we watched the great, yellow moon rise, had dinner, a little music and sleep. I was tired but not so seriously as not to enjoy a song or two.

April 15, 1979

GMBC

Dan Warrick led a group of us on a walk up the draw north of the cabin above Cove Spring. It was one of those fine clammers up a rocky slope and canyon to a divide where we could see the world. The day was absolutely clear and only gentle breezes abated the heat. It's spring. Little green swords of fiddlenecks and grass and tender hydrophylls made gardens of little hollows shaded by pinon and junipers. At these places a few granite boulders leveled the ground, pine duff made it springy and tufts of *Hilaria* grass were tastefully planted about.

We threaded our way up, alternately taking the creek bed and the rock hillsides. Much of the way a little crystal creek flowed through, rocks bordered by stream monkey flower (*M. guttatus*) in banks up the sandy shores or covering the rocks under big boulders. Back deeper in crevices, ferns poked their fronds out for sun and the *Eucrypta chrysanthifolia* twined, green with little white clots on its fernlike leaves.

Up the banks the rains had sprouted banks of *Amsinckia*, the blue-purple bells of *Phacelia campanularia* under bushes. A few chicory—*Rafinesquia*—threaded up to white flowers. The soil of slopes was moist and at higher elevations one could see how it had expanded under snow. The clinking of the stones of the slopes was muted by this moisture and our footfalls were quiet.

Up we went, clambering up alongside the long cascade where the slight flow of water was guided by an algal meshwork—orange and brown, and then in the slopes amid the cholla and catsclaw. I drank often from the little cups of clear water on these cascades, knowing that arid slopes lay above. As we treaded our way up past cholla and yuccas, we heard a buzz and saw a big rock rattler (*C. mitchelli phyrus*) in a catsclaw, testing the air with its tongue, in a striking coil, the body inflated so that scales were separated by stretched skin. We left it to deflate and wonder at its fear.

On up we went to the ridge, Dan a compendium of names and information. So much he straightened out. Randy, Larry, Pam, Susan C., Sue, Steve, Jody, Don, Dan, and Wendy were companions and good ones, too, passing the water flasks around under the pinon when we had lunch, threading our way over rocks and meadows and finally converging on a rocky promontory where we could see Granite Peak across the central valley to the dunes, [?] Dome, Ivanpah Mountains, and the faintest outline of 8,100 ft. Clark Mt. to the northeast. We shared landmarks and surveyed our world.

On the way down I heard a whoop to the left and two of those with me came up with a ram's head and horns and then a whoop came from the right and Dan had come up with a manzanita in full bloom. No member of the Ericaceae had been found on the mountain. It proved to be *Arctostaphylos glauca*—known nearest from the Little San Bernardinos to the SW. A real find!

The manzanita was at about 5,200 ft., in a rocky cave. It seems to spring from many branches, some only partly alive, a thread of life running and twisting along branching to the flowering tip. There seemed to be no basal woody portion from which these branches sprang. Leaves were smooth, and light-green and pink bells hung down from branch tips.

Back at camp some went swimming and some sat on the porch and wrote notes, as did I, enjoying the waning day, and the quiet scene.

April 16, 1979

GMBC

We went to the dunes today and once again I made it up the slope, though this time only one was slower than I and she didn't even trip.

My, but it was beautiful out there. We arrived early, about 7:30 or so and made our way across the sand at horned toad time; we caught two and the *Callisaurus* and *Dipsosaurus* weren't yet out. I went under forced draft up the serious[?] with Dan Warrick. He soon enough left me to take my 20 steps, puff, and come down to some sort of equilibrium before going on again. At first Dan stepped on the ridge, one footprint on each side and that was fine. I liked it. I could walk in the steps, and it was very measurably easier. Then, Dan switched to one side and I slogged and struggled against the soft sand. But finally I made it to the top. We talked about sand and playa lakes, buried ourselves in sand, and wiggled our toes before jumping off for the descent down the singing slope. Some tumbled, slid on bellies or rolled. Most of us put our ears below the surface to listen to the mountain sing its low, vibrant song. I lay fascinated as people slid past me or took giant steps near me. Each set the mountain humming. Each step gave out a low note—the lowest of the complete chorus of sounds I heard. A slide of someone passed me on his or her belly. Deep throaty thrums came in cadence with footprints, the sliding sand two or three steps higher. As I lay here the mountain continued to sing even though people apparently lay still or were distant. This sound crept higher and I could hear little thrums in a kind of counterpoint. It was nearly directionless to my single, buried ear, except that one could detect where footprints or slides came from, more or less. But the steady hum of the mountain came from everywhere, and I thought I could feel it on my cheek which was laid against the sand. Strange earth music that reached into one.

Two or three of the men ventured to run the dunes naked but some timidity held the girls back, a timidity that left them when we later washed the dust and sand off in the pond below the cabin.

That mountain! Such strange inchoate emotions as I lay on the steep slope halfway down, clasped by a thrumming mountain. So beyond imagining, insignificant on my part, as I lay there listening into the depths of the dune.

Dave Sofer was pretty sick so we headed back to the cabin, had a dip in the pond, and then most of the group went off to the Hole-in-the-Wall and the petroglyphs, and a few of us stayed at the cabin to laze the afternoon away. I snoozed and walked down to Cove Spring to look at the cottonwoods. I counted eight alive from a distance (I may have overestimated—there was one dead sapling still with withered leaves on it).

The bus came back just after dark and we had dinner, songs, dishes, talk, a fire, and such.

Right now a group of maybe 10 people are clustered together on the front deck singing to Kathy Clark's guitar.

April 21-28, 1979—Mattole River

April 21-28

Mouth of the Mattole River, Humboldt County

A long van drive up to the Mattole River. I slept a fair bit of the way, having had close to zero sleep the night before. So it all seemed short even though it was 4 PM when we reached A.P. Way County Camp, about 6-8 m below Honeydew on the Mattole. Honeydew sports some nice shady oaks, an old gas station, general store, and a ball field. Nice folks, too, who sent us down to the County Camp where we spent the night. It threatened to rain off and on, but an old white-bearded man, Hawkeye by name, said he personally entreated "J.C." to keep the rain away. It was clear to me he was Dr. VanDenbergh, and I knew for the first time his line of communications and source of Power. He was a splendid Dr. VanDenbergh and it was one of the few times I've spoken to him directly.

Good reports, in the morning, a wonderful one on shamanism by Mike Fink, and then we were off to launch off boat people about five miles below Honeydew at a metal suspension bridge. The river is a reasonably big and swift one, running through mountains logged nearby clean of forest and now left for sheep. The river itself cuts in a fairly broad bed through these mountains, winding and bending, its banks of extensive sand and gravel bars or cutting close against banks, sometimes banked with tangled willows and alders.

Much instruction and off we went, one boat right into the willows. We watched them out of sight and then headed for Honeydew to buy gas and milk, matches, etc. and then off down to the mouth of the Mattole. It broadens to a wide floodplain with the river slipping along, a bit milky and pale blue in the deeps. We drove out in the cobbles across from Joe Goff Gulch, where a midden of the now-gone Mattole Indians has been found. There were once about 1,200 of them on the Mattole, Bear, a bit of the Eel, and down to Spanish Flats in the King Range. They lived largely on fish and were done in by the settlers who systematically killed them and cheated them out of their lands.

Our camp lay on a grassy, willow-clumped bench across the stream. Many trips by boat and paddles, and we had set up camp under the sloping hill, with the river [?] by and off to the west, the boom of surf. Fog came and went, the sky tunnel snapping bright with stars and our folks came in from their drift, canoe far in front, cold and wet. Apparently it was blowing hard upstream and they were constantly wet.

We sat in camp contemplating a big, black-spotted banana slug named Stanley, observing how he moved. I suspected him of laying down a slime trail and somehow liquefying it at his body surface. It was interesting to see how he lay the mucus trail with his mouth, in synchrony with the peristaltic pulsations of his belly.

Dinner and a few notes and then off to bed.

April 29, 1979

Same Camp

I took the river trip today and quite a trip it was. After breakfast and some presentations on geology we packed the canoe and the rubber boats and drove to the suspension bridge south of Honeydew. Things were readied and I launched out in the canoe with a crew of Doug, Pam, and Leslie. We had only begun when we snarled in the

same bush that nailed Merry the day before. We broached and blipped, emerged, dripping and full of water. Well, so much for arrogance.

(Some of our crew—Larry, Stephanie, Randy—are out screaming and swimming in the Mattole. It's morning and overcast, glum and nippy, and they're welcome to it.)

Anyway, we started off again and mastered the tippy little craft and the willows overhanging the swift waters at the inside of bends. These can be mean places if you swing too close. The water sluices under and often enough leaves little other river in which to navigate.

In the upper river run there were just a few rocks and not many real chutes to run, but snags keep us entertained. We ate lunch on a bar, lizarded on a rock to warm on the bank out of the wind. We changed boats. In the middle of the run I went with Greg, David, and Randy—what a rum crew. Greg, who could handle the boat very well when we wanted to, lapsed periodically into cackles of laughter and ended up in the bushes. Once we ran into the worst snag I'd seen, the raft swung sideways, and we damn near swamped. But by brute force we pulled ourselves out and slid around. My main worry was for punctures from the old broken branches but somehow that was avoided too, and we slid out into the current again, sans two oars, which we later retrieved. We had to pump one section, but it held OK. Everything, needless to say, was soaked. Not long after, I changed to a boat with Brad, Sue Sanford, and Jody. That was a singing boat and we stuck together to the end of the 26-mile drift.

It's hard to do much natural history except in a gestaltish sort of way, when one is so preoccupied with rapids and snags, but we did see some things. The hills changed and became lower and finally we were on a flood plain of gravel and cobbles, across which the river swung. Upstream the hills were desolated by logging, probably with conscious purpose of creating grazing land for sheep. Sheep were everywhere—far up the slopes in steep fenced pastures amidst the burned spikes of old slashed trees. Some knolls were clotted with black stumps. The trees that remained were tattered flags of trees, forlorn and alone, a battered remnant with no attempt at reforestation. Down by the mouth the forested slopes returned a bit, even though second growth. We could at least see a whole spruce.

A white-fronted goose stood on the bank, orange feet and bill—a magnificent bird, especially when it flew. A great blue heron, likewise, flew ahead of us. Mergansers, too, flew close to the water and many vultures tipped and swooped.

The lower river had tiers of bars that produced clusters of 4-foot drop or so. These were exciting to enter, the peaked caps of water and standing waves undulating the boat, as it slid down at 5-6 mph. or so.

Finally, in late afternoon, we nosed the bar of camp and came ashore.

Dinner, talk, much laughter, and then late at night, bed. I was only moderately stiff about the shoulders from the day's row.

April 29, 1979

Mouth of Mattole River, Humboldt County

Last night I could hear the breakers pound and finally they faded away. I was a little sore but that's about all; so it was a fair night.

This morning after breakfast we listened to various presentations around a daytime fire and then set out about 10:30 for a hike down the beach to see what we could

see. Steep hills rise on both sides of the ¼-mile-wide river entrance. The river moves back and forth over this gravelly bed, leaving some banks on each side. Our camp rests on one. It's hard to see a road from camp, but depredations in the forest are clear enough. I wanted to explore south toward Pt. Gorda so we crossed in the aluminum boat and hiked the Lighthouse Road to the entrance.

There is a camp area on the dunes at the S. entrance but it's not for open camping, unless you're up for wind. It's better for the trailer set. The beach hummocks against a steep bluff, clothed with bluff flora—*Iris*, *Ceanothus*, poison oak, *Erysimum*, *Platystemon* (a beautiful one with yellow tips on white petals), *Lathyrus littoralis* (on the beach)—a gray-leaved, pink-flowered one, a yellow *Abronia (latifolia)*, and *Garrya elliptica* (on the slopes).

We walked the beach under clear skies, finding two middens in the sand, mostly filled with cracked mussel shells, and sea urchin spines.

The big event of the day was that I packed my lunch in a plastic bag with bobcat scats in it (used in last night's presentation)—egg, orange, apple, banana. The apple wasn't too good. General hilarity followed when I discovered it as I was peeling the egg—last item. Hard to believe, but true.

Then a group of us left the beach and went up a zigzag trail to the top of the bluff—some 600-700 ft. up, maybe even 1,000. It was a long trek that put me into forced draft ventilation—one-foot-in-front-of-the-other, Ken. Cathy Clark and I came over the top first to an old sea terrace—grassy, dotted with *Iris* and occasional clumps of *Ceanothus*. The grass was dotted everywhere with beautiful little purple-blue violets (*Viola adunca*). It was cold. We'd come up from the sunny beach to the base of the cloud hanging stuck on the mountaintop.

Some cheviot sheep baa-ed and hurried away. Five deer bolted from the brush in a little watered draw. On over the undulating grassy hills we went, stopping now and then to examine a flower or bird. We kept moving in the cold, topped a knoll far above the Mattole and could see clear up to Petrolia. Our camp was a bright patchwork of tents and tarps on the opposite bank. The stream braiding was especially evident.

We tried to avoid a house and came close to another, where a man stood patching a corral, his hammer blows echoing against the bowl of hills. Finally we passed through a gate and looked back at a big "No Trespassing" sign, and another proclaiming the fields to have poison trays set out. Presumably these are the cyanide traps set for coyotes—the ones that spring into the animal's mouth when he mouths it.

Back at camp, we traded stories, talked about animal consciousness, animal rights, and death . . .

May 16-19, 1979—Tuolumne River

May 16, 1979

3.5 miles above Early Intake, Tuolumne River, Merced County

My last class hike of the spring. Nice warm clear weather, we've had so far. The stream sparkles green against the rocky cliff across from our camp. The group is off on various quests—a light group, a couple of temperature groups, people in the river, etc. I gave a good lecture this morning and Larry followed with a fine description of gear and

what the groups should do. We'd plunked down on a grassy hillside under a big, platy Ponderosa pine with everyone in a semicircle, and I talked about radiation and heat budgets, etc.

The hike in yesterday was one of me trying to break loose into second wind and finally making it halfway up. Good sweat, good breathing, and the old pack creaking back there out of sight. My, I was tired though from pressures at home and lack of sleep. But last night Larry, Craig, and I lay our bags down on the sandy bank at the stream edge and had a grand sleep. I slept hard, loving my little double mattress. I'd called off presentations because many people felt like I did, and everyone seemed grateful just to crawl in and drift off.

It is a warm, hardworking group, many fine folks. I'll have a cup of coffee now and drift around and see how they are doing.

Next morning—Yesterday, I'd walked all the way down to our camp by the pool to find people. They'd all gone upstream, so I trudged along alone with the meadow and the *Mimulus*, the bird's-foot ferns peeking out from under boulders, the roaring stream, sun hot on my shoulders.

Back at camp I found Larry circled by the students discussing their findings. He was afraid many were frustrated and was giving them a chance to be helped by others who had succeeded. Nice going, Larry.

In the evening, we had a dance—Indians coming hooting out of the woods, painted from head to toe; many of them had made instruments to keep time. I had made a wooden drum, burned out a punky log and slotted it to knot holes to make resonant slats, and fire hardened. It made a nice Quok Quok sound and a good rascado, especially in Craig's talented hands.

The dance itself was good; this time the men did most of the dancing and the four women stood by dancing lightly and circling the male dancers around the fire. All were decorated from head to foot with both grease paint and water-soluble body paints. The men wore breech cloths and carried fans of pine needles which they virtually burned. Chas Salmon was the drummer on a pair of small bongos. The girls wore nothing but paint and carried scarves. The flickering firelight on the tense muscles of the men and the silhouettes of the girls moving by made a scene of artistic power and grace. I played my drum and generally kept in time, and learned quickly to be quiet when the lead dancer grunted out his command for the beat to stop next sequence around. Mike Fink, our Native American Studies major looked uncomfortable on the sidelines, though he did join in a bit when called upon. I, like Mike, I suspect, hoped the dancers would have told how their recreation fitted the old reality, but they didn't, leaving us to wonder if it was concocted or real. It turned out it had real parts, and the dance group did know, but they told us little.

At the end Mike interjected and told us of the Tuolumne—the cave people who intermarried with the Yosemite, who even now cannot use this, their old sacred valley. But they are organizing all 300-400 of them and may win the valley sometime soon. Mike then read an interminable speech by a Ms. Pinetree, given to a group of medicine men in Seattle. I was irked by its length. Mike doesn't gauge his audience, but speaks from internalities—good, facile with words, knows an amazing amount, but he has that to learn yet.

The dancers stood around the fire and finally the group broke up. I, for one, don't know how to make small talk or to stand next to a naked woman. So, I left, and, I think others did, too. Dancing and swimming, or even listening to a lecture in a grassy field is one thing, but singing around the campfire is another. I find clothes provide a nice shield that lets one sing old songs, dance, and be silly.

I spent a somewhat restless night at our new campspot. Craig, Larry, and I had moved because of rising waters, and are now up the hill on a sandy slope under big old ponderosas.

This morning, after breakfast, we talked about integrative mechanisms, about the past history here, about how long a chain of interlocked organisms one could expect in nature and how they could move together. It was good. Followed by some presentations, including one by Mike on trout, in which Larry had to cut him off. I hung behind as various groups moved out into the valley for various escapades. Merry and Dan missed the morning expedition as they were out on a hike and did not return on time. Are they back yet?

May 19, 1979

Musings at the end of Tuolumne, 1979

We've talked a lot about seeing, perceiving in nature, and yet I think in a real way these methods have been more the landmarks of my history as an unfolding human being and a naturalist than something universal. They are my windows to the world, in a house of glass. I do, however, believe one cannot really see if the internal ego predominates, and I do think guided curiosity unlocks and reveals many, but not all, things. But less intellectualized, almost visceral feelings count profoundly too. Beauty engages our kinship with the wild world. The sighing of the wind in the treetops, and the lonesome owl's call, the cold creek on our skins; these are windows, too.

We can appreciate in our intellectual ways the quiet, slumberous, yet perfect interlocked community of life in this canyon, and we exult in its intricacy and perfection and may then denigrate our own chaotic human constructs. Yet I believe they are one. They merely flow at different paces.

What none of us can yet do, is simply be of this canyon world, or of the desert, or the river. Our beings are too much in evolution for that. But I'm not sure that makes me unhappy. I savor the engagement, the hope, and mystery of a change as great as this, in which every aspect of our lives is being reassessed, and given birth again. What a time to be alive! And what a time to quest together.

What have these times meant to me? In the collective sense, everything. It gives me the rare chance to drink at two wellsprings of understanding. My own, stemming from Larry's and my journeys with you are at an end. I lie here on the pine needle-strewn sand looking up past three ponderosa spires to the domed and scaling granite giant across the stream. Wind flickers the alders, and sun glints and runs along the stream surface telling of a powerful current. Tomorrow we will gather our gear, swing our now-light pack frames onto our backs and head for the blue bus, and then we will go home to other streams of life and other styles, but I hope some of what we have seen and done will stay with each of us.

There's great love here, of the caring kind, and maybe if we know why it came to be, we can recreate it at various other places and times. It grew, I think, because we 25

found places and times to let ourselves unfold, each at our own pace, away from the tug and haul of modern life, and we came to trust one another. Trust, that's it. The key is trust. That, and tolerance for others paces, foibles, and needs. How else could we have been as silly as we have? Mostly the child in all of us lies boxed and hidden beneath social forms we cannot drop easily—the cost is too great. How else could we wander naked through camp, have all embrace each other in camaraderie, men and women alike, if it were not trust?

Released from each of us in this way is the chance to unfold, to reveal, and to learn. No sham has blocked awe, no sham has blocked the child's curiosity, and no sham has blocked our mutual and deep desire to know how we might fit into the vast interlocked warp and woof of that which clothes the earth.

It's easy to mock a person for asking a question as profound as this, and to us, in the alchemy of these times together, such discourse has become as natural as amber dawn's light on the mountain.

My experiences and mullings during wide wanderings and to be with you where I can draw from your fresh wonder and hopes and strengths and timidities and especially your new perspectives of the world as it is and will become under your hands, and those who follow.

We've shared so much. We've felt puny at the bases of awesome monoliths of granite, and yet we knew they too in mountain time would tumble and dissolve like sugar cubes in tea. We've listened with all [?]. We've run for the blue tarp together up on the Villa Creek meadow as the mist sifted down. We've viewed and even spoke to the most magnificent Dr. VanDenburgh I've ever encountered and then heard him sing. We've had fashion shows on the gravel banks of the Matolle, stomped the old bus almost to a pile of spare parts while Fran's family looked on in disbelief as we boarded following an ice cream binge. And we've shared our times and insights with some of the most talented marvelous colleagues a person could have—Dan Warrick, Stephanie Kaza, Jim, Roger, and now Craig.

To you all, Larry's and my fondest and deepest feelings of gratitude, camaraderie, hope, and love.

August 2-September 13, 1979—Kealake'akua Bay

August 2, 1979

Napoopoo, Hawaii

I came in to Hawaii two days ago, spent the night with the Coryells. Grand folks. Carol was there and about to go off to Whitman to college. She wants to be a vet, and is one of the nicest, most stable young ladies around. Roger took me all over Honolulu to look for video parts, and then out to lunch with Cissy Lucy, my fine Hawaiian friend, who has become an authority on ancient Hawaiian dance. Roger thinks she's about to pick up the fallen mantle of Kapiolani Iolani, the great dancer. Wouldn't be surprised. Cissy's obviously now a purist and has little patience with those who tinker with it. Rog took me to the airport, and I flew over here this morning to be met in our little Datsun pickup by Shannon and Melany. We shopped for various things and gradually wended our way to Napoopoo, where we found Bernd and Randy just in from a cruise around in a

rented Zodiac to try to net porpoises with Bernd's porpoise-catching device. "Net" is really a misnomer here. His gadget is a tail-grabber made of a motorcycle spring, a shovel handle, some tongs rubber and pins. [Drawing] It clamps on the porpoise tail, which then swims off with this heavy gadget weighing it down. Bernd says it doesn't seem to injure animals, and because it slows them so it makes them easy and quick to pick up.

It's pretty hot here—sticky—and Polynesian paralysis is setting in. I get sleepier and sleepier. Bernd and Randy have landed and we toured the Manini Point site—a beautiful place on the southern limb of the bay, a little inlet in the lava, a small grove of coconuts, and behind a dense thicket of huale koa and trees, which is the state land we seek to use. My crew has picked out a place for the collapsible house back by the road in—crushed lava and negotiable by most cars, I think. The tent platforms have been built closer to the sea under some trees, within a few yards of the water, probably illegal but certainly beautiful.

Shannon and Melany had told me about it, and they weren't wrong, a lovely place. Right now I'd guess the mosquitoes will come out of the huale koa in droves when the sun drops down. But, it'll be a nice camp, though pretty tight for all the people involved.

August 2, 1979

Napoopoo, Hawaii

We are staying temporarily in a house being rented out by Bob Leslie (he doesn't own it), right down near the beach park. It's a palace—baths and bedrooms and kitchens and places to launch and all. Seven hundred a month.

I'm trying to grab a hold of what is going on. Bernd and Randy are doing fine things, monitoring from the cliff, scars and marks, surveys along the coast, and so forth. But there are pieces we'll have to get at—the sounds, the social behavior, and all our gear is not yet assembled.

The videotape, by the way, does not yet work. It may have the wrong number of lines.

Anyway, after a fine meal of eggplant parmigan and lilikoi chiffon pie and stories, we are off to bed. Randy and Bernd try for porpoises tomorrow. We hope the Zodiac works. If so we will be able to obtain one from NMFS and Warren Stuntz. Off to bed, a bit sticky, no sheets, just a pillow and the air.

August 3, 1979

Napoopoo, Hawaii

More time spent trying to gather all the strings together. I climbed up the pali to the tracking site and had Melany show me how to use the Nikon theodolite. Chris Johnson also came along and stayed to tinker with the instrument after we left. The post is 250 ft. up the steep pali trail, that climbs up through the loose lava and grass, hale koa, and other trees at the N. end of the Napoopoo beach.

A metal suitcase is chained to a tree, unobtrusively tucked out of sight in the bushes. One extracts the tripod, levels it, then puts the instrument in place and does fine leveling, and then zeroes things on the tip of Captain Cook Monument. One can see essentially the entire bay and the accuracy is really quite exceptional. Bernd and Melany

have taken calibrations from the long dimension of the heiau, and back-sighted, and the error was bits of an inch. Commentary is taped as the instrument person talks out the sightings in terms of vertical and horizontal angles, time from a little Casio timer taped to the tripod. These little digital quartz crystal-operated devices can be used as elegant little stopwatches.

Then the behavioral person can talk into the same recorder and later the tapes transcribed. Nice. And Melany is so good at it all, after only six man years of doing it in Argentina.

Bernd and Randy are out trying the capture technique from a Zodiac, and came back at noon, without success. The animals don't seem to ride close enough to use the tail grab. I'm sure they will, though, at the right time of day, when the school is in the right mood.

It's muggy today, and now overcast. I've been calling various officials to get papers expedited, and calling home to get motors sent out, and to talk to Phylly.

Maybe a swim in a little while, to wash off the perspiration. A school of porpoises, of maybe 40 animals in the bay, patrolling back and forth as expected between the boat anchorage and the Monument.

August 4, 1979

Napoopoo, Hawaii

Bernd got up at 4:30, blessing, to run a track on the cliff with the theodolite. Randy, Jody, and I went off in the *Nai'a* to look for spinners up and down the coast, and to add to our store of documented sightings of marked animals. The day was calm with the dark-blue sea rolling and slick and the sky clear until late in the day when the clouds came down from Hualalai and Mauna Loa and covered the nearshore with dark gray and veils of rain.

The *Nai'a* is in quite good shape, though dirty from some sort of soot gathered during the trip over. She also had a portion of one dive step broken off but it will be glued and screwed back in place.

Down the coast we went, and our first porpoises were seen at Hookena, a small cove just before the coast becomes a steep lava flow dipping into the sea as it is clear to Milolii.

We found two marked animals there; one, Floppy, with the top of the fin folded to the left (about 3 in. folded over) and another unnamed one with a slash at the base of the trailing edge of the dorsal, in about 3 in. The latter animal was very shy and stayed with the school well away from the vessel while Floppy seemed always in evidence. There were perhaps 30 animals there, including several young.

Back up the coast we went and about one mile off Palemano Point we came upon seven *Mesoplodon densirostris*; there were two young, one very small, some middle-sized ones and one old animal that was maybe 15-16 ft. long. It had clusters of *Conchoderma* barnacles from its enlarged teeth, that trailed like pom poms as it swam. Its teeth were quite obscured. These rare beaked whales were quite scarred, had a distinct beak, and a rather lumpy melon. The color was a moderate gray, and not the fawn color I remember so well on *Hyperoodon*. As these animals swam they threw their beaks free of the water, and I was clearly able to see the arched margin of the lower jaw, and perhaps a slightly protruding tooth on one. I saw no blows. The animals were simple to approach,

and we were able to motor within about two meters of one or more. They evaded us slowly and once dove for a few minutes before rising again 50 meters away.

I did not get the impression of flight or any great fear of us. I never saw a fluke thrown, and their dorsal fins, as expected, were quite far back on their backs, and very small. I was also impressed with how variable they were in size and shape, as if dorsal fins didn't matter much. Maybe they don't. They dove again and we left.

After gassing at the new harbor at Honokahau we rounded Keahole Point and inspected the reef flats there for the Keahole school. We didn't find it. The afternoon waves had come in and big blue swells swept across the sand and coral, breaking in places. Finally, not too far south of Keahole we turned back. At Kealahou we landed in the rain, had a nice dinner and a drink, and then slipped off to respective places to write or read.

August 5, 1979

Napoopoo, Hawaii

Sunday, and off we went today to try to launch the *Maka Ala*, or the new viewing vehicle. First, we cornered Shannon, who had made up the name—the watchful one—to christen it with Primo, and due ceremony, and to have our pictures taken. Then we hauled it away to Keauhou with the little truck, which was all laden down with the lead ballast bars. Chris, Randy, and I went down in the *Nai'a*, and arrived before the truck. Then, followed one of those sagas that are so typical of field work. We couldn't get to the hoist in the Sunday traffic, had to jimmy a guy's window (who had left his locked truck in the no-parking zone by the hoist), and then once we got the hoist working, the hoisting line broke and fortunately didn't drop the craft very far or on anybody, but such good luck. Bernd was close to being hit, but escaped. We replaced the line with a piece of my old nylon whale line, and had more trouble getting the thing high enough to slide off the trailer and over the rail. But finally, with some windlasses we made it, and then the front port leaked pretty horrendously, and we had to take it out for repairs. That pretty much shot the day up to about 4 PM, and I had signed up to cook dinner so Mel and I went off to the store to buy various goodies like salad makings, and dill. I cooked some mampacha and taapi (looks like a little snapper) and made ice cream with cherry and peach sauce, salad with lime and olive oil dressing, and Mel made nice sticky rice.

The boat stayed offshore with a spinner school until dark and then came in. The school spread as advertised but seemed not to spin as much as I had suggested they do.

A little music and then off to notes and bed. I'm busy editing the *Big Creek Resource Survey* for the last time.

August 6, 1979

Napoopoo, Hawaii

A lot of phone calls today. I made arrangements to go to Honolulu to pick up Phylly and to see Earl Murchison at the Marine Base (where the Navy porpoise work is done), and then called our favorite bureaucrat, Roger Evans of Land and Natural Resources, and lo and behold, he damn near told me outright to set up our collapsible house. He said neither he nor the land board would be here in the foreseeable future and our permit was approved in substance, but the matter of procedure had yet to be completed. So, tomorrow we put up the house to keep people from taking pieces of it

while we wait. Then, we went shopping, buying lumber, water seal, and two dozen other things. Tomorrow we get the house up, I hope, providing nothing has been lifted. Bernd and I walked over to the site and met the Walsh's from whom we will obtain electricity and water, and the native guy who lives in the next cove over, and who, I'm pretty sure was making serious eyes toward our lumber. Jody swam with her porpoises for the first time today, and had some come within about six ft. It was fairly murky, though calm. I think she hoped for more, but to me it seems stellar.

Chris cooked a nice dinner and I built a ladder for tomorrow's work, and now it's note time, and time for a little reading and then sleep. Much talk about food finances comes from the gals, Shannon and Melany, in the next room figuring out shares.

Good day, all in all.

August 7, 1979

Napoopoo, Hawaii

Today we worked on putting the building up. It was beastly hot, and the site is back of the beach, behind a screen of head-high vegetation, haoli koa mostly, and still as a pocket, the black aa[?] radiates fiercely and the sun was unmerciful. We leveled the floor, got it in, put up the studs, and then took a break for a swim. Blessed cool water. Then back for copper plate installation and finally the roof trusses. The siding and roof sheeting remain for tomorrow. I achieved a pretty fair sunburn, but the others only got headaches or lethargy. But, it's going to be nice. I cleared some vegetation away to let in the sea breeze and it did come in a little. We'll have a nice place to store gear, park the car, launch our boat, and we'll be able to run water and electricity from the Walsh house just in back of us. Only things like bathrooms and showers are as yet primitive. We have a lua in the woods, but it's a pretty fair trek and full of bugs. I bought a shower head so we can get washed off, but we'll have to get it in soon. Then, too, the house will be small for all of us, and as yet, pretty open.

No porpoises in the bay today. We keep the scan constantly, which pleases me.

I'm pooped, but tomorrow we pick up Phylly at Honolulu, and I'll spend some time with Earl Murchison. Randy cooked a wonderful dinner of spags, bacon, eggs and garlic, good salad, and wine. *Hydrophorus* came in.

August 8, 1979

Honolulu

I flew to Honolulu in the morning, and visited Kaneohe and the porpoise work being done there—elegant—had dinner with Earl and Sally and then picked Phylly up at a bit after nine. She was surprised and delighted that I had come over.

August 9, 1979

Phylly and I went shopping this morning at Ala Moana and then boarded the Aloha plane for Kailua-Kona. Shannon picked us up. We shopped a bit, picked up a motor for Jody's inflatable boat, ate lunch, picked up mail, and headed for Napoopoo. Then, in the afternoon, I worked on the house with Bernd, Randy, Shannon, and Chris. We got two complete rolls of tar paper in place, and I cleared away enough brush in front of the house to let the breeze come in off of Kealakekua Bay. Never mind that one can

see the house a little as a result, and that is not what we are supposed to do, but it was just too stuffy for life back there and the view will be very slight.

Nice dinner, and then bed. My arm is all puffed up with heat rash and bothers me a great deal. I wonder if I will sleep tonight.

August 10, 1979

Napoopoo

No, not much. First we had a wild wordless party out in the park. People were drunk but they didn't seem to use words, they only yelped and yipped. It went on long enough to keep me from drifting off and by that time I was wide awake and itching. Then the rat got caught on the kitchen sink in a big rat trap and I watched him thrash his last, all buggy eyed as only a rat in extremis can be. So I read and slathered my arm with this and that, and finally drifted off. The crew worked on the house and nearly finished the roof and I don't know what else. I'm up in the hospital trying to get some proper goop to cure my arm and save my disposition.

Kim has a crush on Phylly and in one day only. Wow!

August 11, 1979

Napoopoo, Hawaii

My birthday. Just right having it out in the tules like this. But no little ceremony this! I spent the day shopping for hardware, wood, and heaven knows what else, and ate my cortisone pills which did marvelous things for me arm. The Doc, Jim Erickson, who knew me and my work, and in fact knew Chris[?] Varez from Sea Life Park, and had swum with the spinners there, told me it would take a couple of days for things to calm down. But I must say the first day's calming is a thing of joy. Blisters subsiding and arm depuffing, and sleep!! I seem to have to go through one such exercise ever time I come to a new tropical land. I swell up somewhere, take two weeks at it, and then my skin comes into equilibrium, and I begin to pick up energy.

I had the first of my meetings about the program—this one about sounds and sound analysis, upstairs in the solderatorium, which is the Wursig apartment (we put Kim upstairs so her occasional wails don't disturb the others). Bernd is doing wonders with our gear. We may be able to photograph from the TV screen after all, though my instrument camera won't do it, I'm afraid. We need a wider-angle lens.

Then came the party. A cake with rafts of candles (all Captain Cook had, and still not enough). I mark 55 today. Actually, it was a lilikoi chiffon pie, a taste sensation created from lilikois snitched, primarily by Bernd, who ascends trees like an aborigine, and who rummages in the brush for lilikois. Then we had lasagna, salad, bread, wine, and such. The Walsh axis (Lorraine too) came over. He's an ichthyologist, and she works in the local bookstore. And together they make lovely painted t-shirts with authentic fishes on them very nicely painted. His house is back of ours and we will get water and lights from him, hoping against hope that we will not blow out his fuses in the process. His house was wired for one light in 1908, I think. Nice folks. He told me about trumpet fishes probing their long snouts down in the bellies of moray eels, and at a certain point the moray no longer can bite, only gape, and the trumpet fish eats what's in the moray's stomach. Now, how did evolution arrive at something like that?? Anyway, nice time, good sleep and such.

August 12, 1970
Napoopoo, Hawaii

Oh Frabjous day, my arm is near normal and my disposition has returned to near-normal crochettiness. I held a meeting, but schedules and plans this morning that went on most of the time till noon. It was good and we settled a good many issues. I had a feeling we were on our way with various parts of the program beginning to jell. It's a complicated one, with a lot of diverse parts but its do-able, and we should learn a good deal.

In the afternoon we shopped for bits and pieces and then did a bit of carpentry, and picked up Jody who had spent the day at Hookena. Hookena, a cove about four miles down the coast seems like a zoo. Fights, stolen cars, people living in a cave, and in the midst some nice old Hawaiian types that are born there, and a lovely little bay backed by a lava cliff pierced by lava tubes. The porpoises come in fairly frequently and because the bay is small, it's a place where Jody can expect to contact the animals easily. She wants to live in the cave, and I guess it's her business, but I'm worried about the peculiar fauna of the place. I wouldn't be able to cut it though maybe she could sweet-talk people into it. If she takes a man down, as she plans, she is taking him into a violent situation in which he is apt to be challenged, even if she isn't, which I told her.

Good work on the house this afternoon. The darkroom is partly up, the dining table is nearly up, and other stuff was done.

August 13, 1979
Napoopoo, Hawaii

Shopping this morning with Jody for wood, various small things, food and so forth. Then in the afternoon Phylly and I, Bernd and Melany (and Kim) went to the house and worked. We got a lot done in spite of not having enough tools. The darkroom is up, the sink is up, the electronic bench is in, the shower duckboards are in, the shutters are all hooked together, and I started on the wires for the curtains that will block off the sleeping area. Nice Hawaiian dinner. Tomorrow we go out to Keahole Point for sound work, and for identification of porpoises by photography. We'll try to catch a typical resting school up there, and maybe a feeding group, or one on its way to the feeding grounds. We'll see. Phylly, Shannon, Randy, and I will go.

August 14, 1979
Honokohau Harbor, near Keahole Pt., Hawaii

At dawn Phylly woke me, and we were soon rummaging around for breakfast and piling our gear down by the landing. Bernd came out with us to clue us in to the mysteries of the Lockheed tape recorder and our set-up. Phylly, Shannon, Randy, and I will try for the first recordings of our trip up near Keahole, and at the same time attempt to typify the animals there by photography. We will be able to listen through a cassette recorder and record at 15 ips (about 60 kHz top level) with a Navy hydrophone rig good to about 80 kHz.

We loaded a little food on board, soldered some connections (Bernd did) and then headed out at about 8:00 AM.

Some small schools of spinners were located below Keauhou, and S. of the Kona Hilton.

We rounded Keahole and found a quite large school of spinners in the little bay just N. of Keahole Pt. It was very quiet and little was heard from it save a few squeaks and quiet click trains. We were able to make some nice tapes with modest water noise, and vocal commentary on one channel, on which I described animal position and behavior, while the other carried the taped animal sounds. Phylly, who had been feeling a bit off when we bobbed at the mooring at Kealakekua, was feeling better, and taking in a little sun. I decided we should go back for gas at Honokohau—so we did, being filled from a small tanker at the clock (water also available). Right by the green channel buoy outside the harbor entrance we came upon a 15-animal school (including fore-nip) that was spending nearly all its time down. We made another recording, also largely quiet, and headed north around the point. The day was hot and sunny with a cloud bank capping hualalai and only shading the land. There was little wind and only a modest swell rolled in from the Alemuihaha channel. A trip north to Kona Village produced no more schools. On our way back we circled offshore of Keahole Pt., and made a circuit around the Mini OTEC (Ocean Thermo[?] Energy Conversion) a mile or so offshore—an experimental barge testing the use of cool water from below the clines to boil the surface water under a vacuum. Hank [?] of Mokai Range, I am told, had a part in its design. It works. Whether a larger model would be cost effective is the major consideration, I'd guess. At any rate, it sits on a double-[?] barge, about 120 ft. long, all colored pipes and at the stern bobs a tine-capped pipe down to thermocline 600 ft. below and through into cool water. I can't understand exactly where what goes but two pipes emerge onto shore at Keahole Pt. and there seems to be minimal shore activity.

Back at Honokohan we tied up at the fuel dock and decided about dinner. It ended up hash and sausage and tea and lemonade and crackers and peanut butter. Not long after this repast was complete and we were beginning to think about bed, who should come down the dock but Nell, Bernd, Chris, and Jody, with ice cream, Phylly's pillow, rum, coke, lemons, and heaven knows what else besides. So there, tied to the fuel dock in funky little Honokohau, we partied it up in the gathering darkness to nobody's dismay that I detected.

Bernd, who turns in early, finally called a halt and they trundled off in our little blue truck, and we turned in—Phylly and I in the bow and Randy and Shannon on the stern. In spite of an open hatch right over me and Phyl, I never did retreat beneath the covers.

August 15, 1979
Napoopoo, Hawaii

Phylly tapped me at dawn and after a little coffee and cereal we left the harbor and made our way in calm seas around Keahole Pt. In the cove just north of the point, we encountered a big school (70+ animals) coming on down the coast, traveling resolutely. To me it was obvious that the animals were on their way to a resting spot and still traveling inward. They moved quickly, mostly at the surface, and there was some aerial behavior that Shannon documented. We stopped the boat ahead of them and made a nice tape of them approaching us and passing the ship. They were remarkably silent just as

resting animals are. They traveled very close to shore, a matter of a dozen meters in some cases.

Then, obviously, we were bugging them as they failed to settle down and then turned and began to go north with increasing activity level. We finally reached extensive flats at Makolea-Makalawara; the animals spaced out over the 20-25-ft. deep water slowed and let us travel right with them for more than half an hour. What a lovely place and how magnificent were the porpoises there! The reef flats bow out from shore 500 m or more and then drop abruptly into azure water of the deepening slope. On the flat is turquoise water over white coral sand, but here and there rocks and living coral turn the bottom dark and blotchy. In the glassy, clear water our porpoises hung suspended and their body pattern shone brown, pinkish, and white. Interestingly, over this rather shallow flat the animals spread and slowed. They did not bunch as Kealakekua animals usually do, but swam separated by 3-4 meters from the next nearest animal. They flickered as they dove down over the sand and one could discern their fragmented shapes now in the wavy light as they raced along near the bottom. Randy photographed and photographed, taking 13 rolls I think, of fins and backs for identification. I piloted and was able to maneuver in close for good photos.

We watched them meet, but not join a school coming down from the north. Randy watched it closely and reported that the two groups of animals maneuvered around each other and did not seem to coalesce at once.

We left these, encountered another school northward toward Pau Alu, a paired cinder cone before Kona Village is reached.

On we went, but saw no more porpoises to the north. At broad, shallow Koholo Bay no animals were seen, as has been the case in the past. The porpoises stay well over toward Keahole where access to deep water is at hand (I think) and where nice shallows can be found.

We turned out to sea, but encountered only wedge-tailed shearwaters and slicks.

Gassing at Honokohau (\$140 worth for the trip), we continued S. and reached Kealakekua at dusk.

A nice welcome, a nice meal, a swim, notes, and home.

August 16, 1979

Napoopoo, Hawaii

Look, look, a new typewriter ribbon courtesy Oshima's Drugs (one can build a complete battleship with parts on stock in that store). I also bought two colors of paint—all they had. Ballet Blue and Nugget Yellow. One for the electronics bench and one for the kitchen sink. The main problem is splinters and the paint will help the poor ole wood that is drying out so much. After a morning of letter writing to various people, I totted up bills and went over to the house to do work. I painted and built shelves. The porps came in, and the folks up on the cliff had a good time tracking. Tomorrow, Phylly and I go off on a little trip around the island, to visit Hilo and the volcano and then back. Phylly goes home on Tuesday. Shannon's friend, Dave, a bacteriologist, or is he an algologist, comes in tonight. Bernd drove down with her to the airport because Winifred the Datsun pickup is acting in need of new points and distributor cap. But running. Our tapes from the trip seem OK, though we did have a mistake on how the tape was put on the machine and

there was bit of cross talk from my voice channel to the data channel. Bernd quickly saw how to fix it by adjusting the roller. He's amazing. Everything works in his hands.

August 17, 1979

Hilo, Hawaii

Phylly and I set out to circumnavigate Hawaii for a couple of days before she has to go back. I decided to take the time off since these chances don't happen very often and we hadn't really been out together since last summer. Bernd planned to drive us to the rent-a-car place in Kailua, but Winifred (the Datsun) was feeling out of sorts and we only made it to Kealahou when she refused altogether. New points, condensers, plugs—nothing satisfied her and there she sat looking cross, her mag wheels all muddy, and her wide-track tires pooching out. Finally, I called a cab and we left Bernd in a light drizzle looking quizzical, the hood up. At Kailua we transferred to a Mazda—a nice little peppy car with good gas mileage, but some one's cat had decorated the interior somewhere. It wasn't till Hilo that we counteracted it adequately, first with a lavender gizmo that made a noxious effluvia called Eau de Cat and Lavender. Sears provided us with a pine-scented little vial that I hooked under the dash. That helped.

We headed up Kamuela way, crossing the lava flows of the saddle, passing the PuuWaaWaa ranch at mid point, and then down onto the long, sloping plains of Kamuela. We stopped at the Parker Ranch museum, and enjoyed it thoroughly. It told the tale of an early Yankee coming to Hawaii, marrying a Hawaiian gal, becoming friends with Kamehameha I, obtaining land, and then starting the dynasty that goes to the present, and Richard Smart, the present lineal owner at 60-some. They invented a way of life, the paniolos, the various attempts at diversifying—each time they came back to cattle on the vast land that finally stretched across the island—325,000 acres now. We saw some of the best on Kohala—a relentlessly green land, of grass overwhelming the lava beneath, eucalyptus windrows that divide pastures, Herefords grazing with their simple mechanical gazes, not asking for more. Even the bulls have a plasticized look, as if aggression from them would hardly be pure, and maybe stop in mid expression.

We traveled down the slope of Kohala-Mauna Kea to Honokaa, where we visited the macadamia nut factory, amid cute signs telling us things were nutty and we were getting closer. There a glass-walled sorting plant let us look at girls doing awfully boring tasks (sorting out dark pieces of nuts) and being given high-flown titles (assistant cook) after 14 years apprenticeship. The owner's lady, a comely Italian lady, was pictured using macadamia nuts for everything. They were immolated in various jams, looking out of place, there were bars of chocolate with a single nut embedded, there was soup. We liked the brittle, an honest use of a very fine, tasty nut.

On down the coast we purred, or hummed, as Mazdas are supposed to do. It did. Nice car, except for the cat, which we can hardly blame on the maker. Fields of cane cascade down the slopes to the sea, and I guess the windward coast keeps the clouds coming and the rain sifting down. We stopped at Akaka Falls, a 400-ft. clear drop of brownish volcano slope water, pounding into a pool below, where the mist rises so continuously that nothing at all grows for dozens of yards from the place where the water hits. Not far to the south we topped a rise and could see Hilo Bay.

The walk at Akaka Falls was notable mostly for the array of moisture-loving tropical plants through which we walked. Banked ginger made the air sweet.

Phyllodendrons, ferns and vines were everywhere amidst the trees. Down below a stream glistened over brownish rocks and I wondered if any fish could be this high, above the various low falls, or shrimp, and I saw nothing amidst the bamboo-shaded pools.

It was especially pleasant being with Phylly, who is so filled with pleasure at these chances to walk in the tropical places where her plants grow in such profusion. I was fascinated, here, and elsewhere by the array of reproductive means shown in the flower types we examined . . . from the strange, glutinous conjoined anthers of some primitive flowers, making me wonder if the sperm swim free in some of them, as they do in ginkgo trees.

We stayed at a Travelodge on the hotel strip, went to dinner, a hula show, just like good tourists, except we knew the Hawaiian words to “Pearly Shells”.

August 18, 1979

Napoopoo

After bits of shopping we headed up the Volcano road, visited a lovely Hawaiian 20-acre garden (Nani Mau) filled with a bewildering array of wonderful tropical plants. They seemed to have burst into bloom for us. There was an *Anthurium* forest, with hundreds of these plants in sawdust on the forest floor, acres of orchids, a fine arboretum, and more. They fed us exotic fruit—a *Eugenia* relative in which one eats the flower, and which one of the gardeners said was better as a pickle, then something like a cherimoya, and some sweet pineapple

It was interesting to see how Kilauea had changed. One had to hike a long way to Halemaumau, but the white-tailed tropic birds were there circling in the fumes and steam. We drove down the Chain of Craters road, took off to the side, going through gnarled ohia forest to a kipuka (nene) and down to the escarpment to the Ka’u desert coast.

We went around the southwest tip of Mauna Loa, up into dense ohia rainforest, past lots of nice grassy ranches to the kona area where coffee took over—growing on bare lava slopes, apparently a continuous crop.

Because we hadn’t wanted to drop in, in the midst of a prepared meal, we stopped at the old Manago Hotel (established 1928) and had a marvelous \$4.50 meal of ono, rice, Japanese cabbage, and vegetables, tea, etc. It’s a wonderful funky old place. Then home again, to the place where our compadres had finished a session with some TV people who sounded nearly incompetent to me. It was a fine two days with Phylly, and we both enjoyed it.

August 19, 1979

Napoopoo, Hawaii

Jody did a swim with the porpoises in Kealakekua Bay today and seemed to have been drawing them in. Bernd was impressed with her success yesterday, and she did it again today. I answered letters and tried to take care of problems long distance, and then worked on the house, painting blackboards, installing sinks, drains, projection screens, front porches, tables, and a lot more. Shannon worked on screens, and then she, Randy, and Mel worked on the porch. It’s up now, and is a nice open place to sit in the afternoon, though a little hot right now. I also dug lava out of the road at a place where we had to take evasive action before.

I was a bit grumpy from a belly ache until late in the afternoon when I began to feel better. Nice spag meal by Randy.

Napoopoo, Hawaii

Good day today. The morning was spent fixing the house—setting the darkroom sink, putting in drains, showers, painting the porch. Then in the afternoon, Randy, Bernd, Shannon, and I went out to record the exodus of a spinner school out of the bay. We chronicled zig-zag swimming, and then followed animals offshore, making a series of recordings on the way. It was a large school, maybe 70 animals, and when it reached a mile or so outside the bay it literally split up and went in spread formation both north and south. We finally lost it, and then picked up a spotter school from the very high (in excess of 20 ft.) leaps without spins, falling back on flanks. Bernd, Randy, and Shannon had never seen a spotter before so it was a good time. The school was very large, and very spread over a wide area of sea, and I cannot really estimate numbers very well. It was huge—maybe hundreds of animals though we never saw that many. We followed them down to beyond Honaunau, and at times they approached within 100 m of shore. It was getting dusk by this time. Do spotters come ashore at night?

If so it is the reverse of the spinner, who rests ashore during the day. I would like to track some of them to see, and will likely apply for an exception to test it. We could catch them from the *Nai'a*.

Today is Phylly's last day. She and Mel had a good time at Honaunau, looking at plants and talking to rangers. I'll go to the airport with her very early tomorrow morning, and then a month later go home myself. It's been grand having her here.

August 21, 1979

Napoopoo

Mostly housework today after taking Phylly to the airport early. She seemed so happy and pleased to have been here. I loved it. She's *such* a wonderful gal. How lucky I am!

Afterward, Jody and I drove north to look at Makalauena beach as a place for her work. We walked 1½ miles on a nice road across the Paholhoe, but the second locked gate stopped us. Later we learned that it is Bishop Estates land and we hope for permission. The reef flat offshore houses Kona's largest porpoise population, has clear coral sand beaches, palms, and [?] and maybe water. There's a house there.

In the afternoon I worked on the house, putting in shelves and running the water line through the haole koa amidst myriads of big garden spider webs. It didn't reach by 150 ft. or thereabouts. Then, we are getting ready for tomorrow's flight—we have to be in Hilo at 8 AM. God help us. To sleep!

August 22, 1979

Napoopoo, Hawaii

Flight day, and a long one too. We were up at about 4:30. I never did know really, had a cup of coffee and a bowl of cereal, stumbled out to Winifred, waiting patiently in the port cochere (or however one spells that!), and off around the south end of the island. It was a nice drive with much discussion of this and that. We pulled into the Hilo airport about ten minutes past 8:00, and our pilot, Sam Jones, was there, as was the Cessna 172

we would fly. After a bite of breakfast we boarded and took off to the south. Sam is a burly contractor who flies for the Civil Air Patrol and who is volunteering his services to us, with just plane rental being paid. Nice guy who seems a good pilot, though I expect not deeply experienced at his craft. At least he hasn't had to ditch yet, and that's good. No hot dog, he, but just a guy trying to be careful and conscientious. He understands the gobbledegook they put out from the towers, and that speaks well.

Anyway, off we went to the south, along the Kumukahi coast, around Kalapana, below Kilauea, to Ka Lae. I saw a tight school below the surface at Kalae, but we never could find them again. The wind had picked up from a dead calm to a whitecap-dotted sea with foam trails by the time we rounded the point. It soon became calm again as we went up the Mauna Loa shore, passing Milolii, where there is quite a little village, with what look like house lots north of town and a decent paved road in down the face of the lava flow. Here and there up this coast are little coves with sand, a few palms and kaiwes, lots of old stone walls, house foundations, and so forth. The glassy sea failed to yield up anything until we reached Hookene however. There we saw a few spinners and one big manta ray.

Up at Kealakekua we found our school back against the bluff, Mel and Chris up on the tracking station. We talked by VHF, and Mel came in loud and clear, but apparently Bernd was less clean because of airplane motor noise, but he could be understood, and maybe with an adjustment about how he talks it could be good. As we circled, Randy said: "Let's take another look at the Temporary shelter and the tent sites." When we did so it became apparent that the tent platforms were gone. Cockaroached. That was about 500 dollars worth of wood. Then I noticed a pile of plywood and timbers back of the Iolani Waihi house, which looked suspiciously like our stuff. We flew over again, and the others were in agreement. No, our work was cut out for us. Off we flew, seeing *Tursiops* at Keahole, headed for Keahole, and just as we were in our landing pattern (for gas and lunch) Bernd called out "Porpoise" from the cove just north of Keahole. But we landed, had a sandwich, and then looked at the animals from the air—a group of spinners in very close to shore. Right where they're supposed to be. On up the coast we looked at Jody's chosen site at Makalawena. There's quite a camp there; for tour busses that come in a couple of times a day, and the old house is to the north under the Kiawes and palms. Jody found out that it was once occupied by an old guy who kept goats, and that the goats come down there still.

As in previous tries, not a porpoise did we see to the north along the whole lovely bight—Koholo, Mauna Kea, Kawaihai, until we passed Mahukona. There we could see the house walls of the old settlement, all cleaned and explained for the tourist. Just south of Opolu airstrip we came upon two groups of *Tursiops* lolling along.

On around and into the Alenuihaha we went, being buffeted by the turbulent winds that sluice around the tip of the island. Soon we were traveling along the Kohala coast, which is a lovely escarpment, plumed with long waterfalls and cascades, most falling into receiving pools not far above the tideline. It is very much like the north coast of Molokai really, with the long, deep, flat-bottomed valleys, all lush and green winding back into the clouddeck that caps the Kohalas. In some, wide streams wound to the sea.

No porpoises, though, either there or along the Hamakua Coast. I was having trouble with attention then, and found myself drifting off for a few seconds at a time, to catch myself, screw up my resolve, and then slip again.

Nothing in Hilo Bay, and we landed, did a bit of shopping, headed up the coast to Waimea and around to Kailua and home after dark. A long, long day.

Then, we skulked over to look at the plywood situation, and indeed it was gone, slick as a whistle.

August 23, 1979

Napoopoo, Hawaii

Well, with fear and trepidation, Randy, Bernd, and I, first thing after breakfast (our last) advanced on the old dancer's house to confront the plywood cockroachers.

Instead of some big Samoan, we were met at the front door by Mrs. Prim, a smiling, 70-year-old Hawaiian lady with scant few teeth. "Aloha," she said, greeting our intrusion into her front yard. Later she explained one could call her Mrs. Primo by adding an "O," but she didn't drink.

She called her daughter, Fern, over from the opposite house to join the conflagration, whose origins and aims she didn't know, and didn't press. We made light conversation. I let them know about my time in Hawaii, and that I had seen and admired Iolani (Iolani is Mrs. Prim's sister). Like her mother, Fern had a nice, open face. I then launched into our project, explaining what we were doing, and then around to July, the rains, and the tent platforms. On and on we went, until we had to leave them because of the state and Roger Evans, the bureaucrat, and that we were going to have to go back, to them again. "Oh, you wanna know about the plywood," said Mrs. Fern cheerily. We got it out back. Some guy down at Honaunau told us it was left by some hippies from the Bishop Estate. Mrs. Prim pipes up—"It's all out back except for the three sheets I got uppa my bedroom." "Mrs. Prim," I interjected, "I give you those in honor of your sister whom I so admired." More conversation, not refusal, not agreement, but the ownership changed from them to us, somewhere in there.

About that time, down the steps comes Jerry, a giant Hawaiian marine on leave, six ft. three of chisled bronze in a crew cut. He joins the conversation at the listening end, volunteering very little. I'd of had trouble with him if he'd been the first out the door.

We leave, inviting them over and proclaiming that if our plywood has to be cockaroached we'd rather have them do it than anybody. We will invite them over for the dedication, and I don't really mind them taking the stuff very much (except it cost us \$500, and we could scarcely afford letting it go). It was out lying in a clearing for a month, and the competition between cockroachers gets fairly tense—who's to get it first, so you gotta move quickly—ownership becomes subordinate to competition. Anyway, we got it back. I'll leave it there for a day or so, and then retrieve it. By the way, both Fern and Mrs. Prim were Prison matrons, or police matrons, which they laughed about.

Then, we'd been turned down for a gas allocation on the grounds that we weren't old customers. The station told us to get turned down again by someone else and then make our case to the head office in Honolulu. In view of the fact that it took a month to get turned down the first time, I said, "To heck with that." I called Honolulu, wondering if I'd meet another vintage bureaucrat like our Roger Evans, but no, Al Harris was a comfortable old shoe, even if head of the state's energy allocation program. He said even if DOE was incredibly fouled up, miraculously they did handle for FEI 15, or whatever it was, rapidly, which would put us on the list, and in the meantime, he could make emergency allocations month by month for us. Furthermore, he'd send us the forms right

away, and we could return them directly to him. Now, that's service. Crowing over two victories, I launched into more amorphous crusades, like getting the final water pipe for the house, the wire to hook up to Bill Walsh's ancient electrical circuitry (his plumbing is equally ancient . . . there's one valve in the entire thing—at the main shutoff). I bought Jody a nice floating dive flat, got aluminum wire for half price, made a very reluctant salesman roll me out 140 ft of water pipe (saran black, ¾"), and then home to cook dinner of omelettes for all hands. I took the stuff over to the house and tried to figure out how we could run the electrical wire unobtrusively. Not easy. Tomorrow we retrieve wood, try to catch porpoises, and put in the water system, and maybe the electrical system. I'll build the screen around the shower. Then, we'll be pretty close to ready for a move. Oh yes, I also found us a refrigerator for \$100 bucks that should do us—a far cry from the rinkydink little one for \$395 just because it was propane, over in Hilo. Bernd solved that one by upping the electrical load we will take from Bill's circuit, hoping the entire thing doesn't collapse in a cloud of pulpy wood, cockroach wings and termite scat.

August 24, 1979
Napoopoo, Hawaii

I worked on the house today, running water lines and power lines through the haole koa to Bill and Laraine's house. It was sweaty, spiky work, hauling the line up in the trees, and braving the spines that are *all over* the kiawe trees, trunks, and all. Getting up and down one of them is an experience. But, we got water to run through the pipe, and electricity is yet to come pouring out of the line, but we do have a fine telephone pole, and the wire ends reach in both directions.

August 25, 1979
Napoopoo, Hawaii

In the morning I made a trip to town for various bits of pipe. I want to finish the water system, get it hooked to showers and the like, and I almost made it except for a few miscalculations. With the system we will have hot and cold water. Bernd, meanwhile, worked on the electricity and came close to finishing that, too.

Gordon Leslie came in, all full of swagger and accusations about the evil things we had done. Our house was too grand—seemed the major problem. It, of course, is exactly as advertised. Actually, he was feeling ignored, I think, and was probably also probably on the take. I'll resist that. He also asked if we might be interested in writing a little piece for a newspaper that his association puts out. Sure, I said. I think he thought I'd refuse. He picked especially on our water and power supply and may make a fuss, which will make things a lot more difficult for us. We'll see. I'm perfectly prepared to collect all effluent in barrels and dump them in the dump, and run a generator, however inconvenient it might be.

Damn nuisance, especially when we are trying so hard to get our work done, and want no trouble from anybody. He seems also to be spreading the rumor that we might be chasing the porpoises out of the bay, which is not at all true.

But, in matters such as this, egos are important and truth isn't. So, we must assuage the ego if we can, without losing our own footing. We did join his Community Association for 10 bucks.

Anyway, Bill and Larraine came over for dinner, and have just gone home.

August 26, 1979
Napoopoo, Hawaii

At about 8 AM we headed for the *Nai'a*, Randy, Chris, Shannon, Dave, and I, and spent the morning making recordings of a large school (50-60 animals) of spinners in deep rest. At times the animals reacted to the boat, even though we might be 300 m away, by edging for deep water. Rather seldom did they come very close to us as we recorded, though once in a while they appeared within a dozen meters or so. Shannon kept aerial behavior, I made comments on the comment channel, Dave deployed hydrophones, Randy drove, and Chris looked for marked individuals. The animals were very quiet, both in terms of aerial behavior and sounds. Chris said there were whistles, but I only heard breezy click bursts and occasional chirps. Mostly it was snapping shrimp and outboard motors.

We had lunch, turned back to the mooring, and went ashore. A calm, lovely day it was, and we did obtain some good recordings. Dave was able to cook his lily-white body while telling me his interesting work with a parasitic bacterium that lives on an alga. All scanning EM and nutritional work. Very interesting stuff, and I like him a lot. He's bright, balanced, and broad in viewpoint.

Back on shore I set to the business of adjudicating with Gordon (if I can). I prepared a little piece on our project for his consideration in *The Native Hawaiian*, a tabloid about native Hawaiian affairs. He's ticked off at us and though he isn't even an elected officer of the Napoopoo Association, he has the title by default and as such can dream up endless things to plague us. I hope we'll soon be boring to him, and he may turn to other novelties to occupy his paranoid and befogged mind. He thinks he wants us to look tropical by putting palm fronds on the roof—we'd be the only house in Napoopoo thus decorated . . . but I said, "Great, it'll make it cooler for us." I worry only that people may sidle up and order maitais from our front porch, thus disturbing our work. He's a case—dark, very Hawaiian, full of internal evasions about others lying, while he, himself, is uttering the blatant falsehoods to us, which are utterly transparent. We know, but I truly doubt that he knows—his evasions are so deep that he mustn't admit to himself his status or he'd lose everything. He hates his Uncle, Bob Leslie. They had a fight at a luau, and because we rent from Bob we are unacceptable. He hasn't succeeded at anything. He can't even get us to kick back to him. He owes everywhere, but his parents take him in at the age of 31-34, and hope for the best. He has "secretaries" in his grandmother's house, when in fact he was told to leave those precincts. He has a restaurant at the dock, when in fact the planning commission has refused permission. He has school groups he is training when in fact they are illusory. Dear dear, and to be his pet. I'd rather not. I've made my obeisance and will make no more. It's better to let him turn to other things. That's life in Napoopoo. Sounds like Kaunakakai, where we had to find local entre to work at Alii Pond. Tonight, Manago Hotel for dinner.

Ooh, good opelu and rice, with pineapple shake afterwards at Sandy's and then a slide show of dorsal fins by Chris, Very nice.

August 27, 1979
Napoopoo, Hawaii

Gordon's at it again and bitching to the Walsh's about our water and electricity. Bill thought we ought to see Ms. Kakakau, who is a relative of Gordon's and secretary of the association, so Bernd and I did. She lives in a lovely, glassy house full of koa wood. She was reasonable and pleasant and spoke of the energy of her young people and how her job was to keep them on an even keel. We showed her our plans and left much calmed because somebody of her intelligence and probity was on the Community Association.

Other than that saga, still no final permission from the state over occupying the conservation district. I put in water pipes and worked on showers and the like. It's nearly done.

Jody swam with porpoises today and is getting closer and closer. Mel was her tender. They work very well together.

August 28, 1979

Napoopoo, Hawaii

Gordon ruined my sleep last night. Apparently, he's angry because, in part, in my book *The Porpoise Watcher*, I mention historical records of Capt. Cook being cooked and some eaten, and the long bones returned to his shipmates for burial. I think I took that out of a history of Capt. Cook, though Dawes only mentions dismemberment and burning of the flesh. At least I'm suspicious this is part of the problem of continued harassment and attempts to find anything to pick on. More, though, I think it is a simple Anti haole paranoid personality given a little power. He's angry that the County didn't give him copies of our submission and approval, and I can understand that—though he is so troublesome. I understand they don't want to deal with him. We may lose our power supply but I'd guess the water is OK.

Gordon had his picture in a native Hawaiian paper and he hands out copies like business cards. Well, I think we'll weather it OK, but it is annoying and he can cause us trouble.

We recorded today in Kealakekua with Jody in the water with a very quiescent school. We could hear her call clearly enough in air, in water, I don't know. Our audio feedback amplifier is weak.

Then Bernd and I went up the hill and found that our refrigerator seems OK—it shocked Bernd as he opened it in the rain—the plug was wet. But now it's OK and we loaded it up for \$100 and headed home. I set up Makalawea for Jody through Roger who knows Dick Lyman, the head of the Bishop Estate Board of Directors. She's ecstatic. My, my but life is complicated.

Jody's animals were remarkably quiescent some of the time. She and Mel followed them clear out around Keawekaheka Pt. Their behavior changed dramatically, as I expected, and they began to bow ride and place[?]. Torn-hip came in and rode and other marked animals did too. Pretty clearly there is age segregation in schools, beyond juveniles and young. There seems a preponderance of marked animals that swim together and that have tall fins and big bodies. They may have had time to become scarred.

August 29, 1979

Napoopoo, Hawaii

Bernd and I were up at dawn (before), had a bit of breakfast, and made our way through grass, garden spiders, and haole koa up the steep ridge to the theodolite station. Bernd set up the gear, leveled and zeroed the instrument, and we were ready. We didn't have long to wait. About 50 animals came quietly in from the north around Cook Point. They were soon deep in the bay. The yacht fleet began to wake up, Francoise on a ketch emerged (I was looking elsewhere) in the altogether and another regular too. Then another school of perhaps 20 animals came in across Paluau Pt., making directly for the school already in the bay. My impression was of somewhat increased aerial behavior on both sides until merger, but I can't be sure. At any rate they approached directly and when 100 m apart the moving school partly veered away but then kept on and merged.

I stayed on post for three hours, went down to make phone calls, and then drove in town with Shannon and Dave.

We bought (I bought) a propane stove for the field shelter—in a second-hand store for \$90. It has burners and oven and broiler and works. Will get it hooked up.

Then I searched out a minister for our spiritual dedication of Hana Naia (our project name, which means porpoise work). First, I went into the old Kona Congregationist church in search of Rev. Boshard. Instead I found his tight-jawed secretary, who wanted to know why I had parked in the church parking lot. I explained. Kahu (Boshard), she said, was in Honolulu but could talk to me when he got back. I mentioned I'd been given Leon Sterling's name.

She allowed as how he did a lot of such blessings, but wasn't ordained. I didn't mind. She said I could call him. Apparently he works for a competing church (a sort of stringer, I guess). Anyway, I called him and he agreed.

Napoopoo, he said, was a heavy area, the cliffs, the heiau, etc. He knew instantly that I was a haole and he knew I wanted peace with the Hawaiian community. I told him our animals were special, too. Anyway, he'll do it. I'm setting things up with Roger Coryell. He'll fly over, maybe with Cece and Lehua. I invited Jim Simmonds, our mechanic. I'll invite others here. So, those wheels are turning.

We cleaned the stove a little, set it in place, put on the last pipe fitting—spag dinner a la Jody and now notes and a John O'Hara novel. It's hot!

August 30, 1979

Napoopoo, Hawaii

Today we launched the *Maka Ala*, up at Keahou. Randy, Chris, Aaron (from Bill and Laraine's) and I drove the *Nai'a* up—a nice flat-calm day while Bernd drove the *Maka Ala* up with most of the ballast in Dave Coder's VW, so poor ole Winifred wouldn't have to strain. At any rate we all arrived together and this time backed the trailer in and attempted to float the ungainly ole *Maka Ala* off. We had Winifred's tires in the water and still she wouldn't come off. Finally, we had to do it by hand and off she came, all imbalanced and tippy. We loaded her with lead bars and only once did she seriously threaten to turn turtle. We didn't have enough ballast—she needs perhaps 400 lbs. more. Then the windows leaked about as ferociously as before. Oh woe, woe!!

I hoped the water would swell the wood and seal it, but an hour or so's watching didn't bear out that idea.

Bernd suggested underwater epoxy, and soon enough was off to buy some. I went to buy supplies for our Milolii tomorrow, and Randy took off for gas in the *Nai'a*—I saw him planning straight as a die across Kailua Bay.

Bernd's putty largely worked when gooped over some exposed screw heads. It collects only an inch in the window overnight now. It was quite a grampus-ish job putting it on—taking a big breath, submerging, and then surfacing for a blow.

Chris and I decided to drive the *Maka Ala* back. It took three hours or so; she's slow with a 20-horse engine, and cranky. It was a wrassling match keeping her going straight. It was dark before we came in and 9 PM before we had her boomed away from the moored *Nai'a*. Cold spags and a lilikoi pudding on the beach and then to sleep.

August 31, 1979

Napoopoo, Hawaii

At about 8 AM everyone was aboard the *Nai'a* and we headed off S. toward Milolii. It was a nice calm flat day. Bernd and Mel, Jody and I were crew. Our hope was to find and photograph spinners at or near S. point (Ka lae) where they have been reported. A group of seven spinners came in just as we were leaving, including a fairly young animal and some adults. Two were marked—one by a nick at the base of the trailing edge of the dorsal and one with a rounded nick in the middle of the dorsal. Bernd photographed them.

We saw nothing until south of Kookena at Lepeamoa Rock, when both Bernd and Jody saw a single animal a few hundred meters offshore. It was wary and we could not relocate it. A single animal, so un-cetacean like.

The sea was vacant and calm as we cruised along the steep slope of Mauna Loa. Rivers of aa[?] streak the slope up into the clouds where lava cascades have poured down out of fissures and vents high on the mountain and cascaded to the sea, leaving their trace of rock.

I slept and finally at Milolii we decided to see if gas could be bought.

But first we went to Kamoi Point looking for spinners. It became rougher and rougher as the trades whipped over Ka lae and finally we turned back. Just then, a big brown-backed shark was seen over against the lava bluff, sailing along. We couldn't see its head but its fin was rather high. I fully mistook it for a marlin [drawing].

It was on the order of eight ft. long, and I'd guess a bit awesome to Jody.

At Milolii, Mel and I went ashore. There's a dock and a couple of buoys for 25-ft. craft. Children were leaping off it, about eight ft. , into the turquoise water, including a little girl, flaxen-haired, who looked no more than five. She was eight, her mom told us. Milolii is a grand, funky little place—palms, kiawes, lava-rubble streets (except the main paved thoroughfare), a tiny steepled wooden curch, a general store that only opens when you ask the lady swinging in a hammock in the house next door. We found one could buy gas from an old hand-operated pump, providing you have gas cans.

At Lepeamoa Rock the lone animal was sighted again. It's very deep there, 600 fathoms or more in places. The animal surfaced in a line four times, disappeared, and was seen again and disappeared for good. It seemed *Phocoena*-like and may have been a *Kogia*—small, fairly high fin, elusive, alone, in deep water, small . . .

Nothing more, We anchored and cooked a good meal and sent Jody ashore (seasick, a bit)—actually she swam.

That's it for tonight. Tomorrow we try to catch spinners coming in.

September 1, 1979

Kealahou Bay, Hawaii

The swell came in all night long, rocking us, but not so violently as to be uncomfortable. I had a nice sleep up in the bow, with the hatch open and the breeze blowing by—enough so I put on pants and shirt (in lieu of a blanket, which I didn't have). Before dawn Bernd was up and stirring. Soon I had water heating and some pancakes in the making. We cast off, and moved out of the bay in the dim light. I guessed they'd come in in the northern sector so we stood off Cook Point, about 1/3 of the way to Palemano. While I was sitting on the afterdeck on the waterproof box I spotted a school of maybe 40 animals coming in from the sea, but in the northern sector, and moving toward us, ultimately to pass not 30 m. off our starboard. We quickly tossed the pickle in and made a short recording before they had gone and then moved in ahead of them, and at about 1/2 way in the bay were able to station and record again, this time a good session before they reached the back bay. Then they moved into the little cul-de-sac between the moored boats and the cliff just below the Pali Transit site. We lay off the white band and recorded. Later, Melany and Randy, at about the same time, spied another school of maybe 20 animals coming in very close to the south shore. We saw them when they were somewhat outside Man-- Point. We ran over a little closer and then decided to make a recording while we were still 200-300 m away. The porpoises already in the bay had done the following very clear thing. They left their little cul de sac and for the first time this morning, moved around the boats and toward the incoming animals and inside, by us. They moved toward the incoming animals directly, and merged with them. The recording we made was full of squeals, whistles, and click bursts. Aerial activity was not, however, at a high level, though perhaps up from the previous level while in the cul de sac. It seemed an obvious swimming to meet the incoming school, and a greeting. The sounds will be interesting, though I wish we could have been closer.

I went ashore shortly thereafter to call Mom on her 88th birthday, got through, and had a nice talk. I talked to Phylly and she told me Tim Brown had died on Santa Cruz Island, possibly of a heart attack, and Pat wanted me to speak at a celebration for him. I'll have to leave right after our little ceremony here, probably going back to Honolulu with Roger and thence to L.A. All so unexpected. Tim may have been close to 50, but no more, and seemed healthy. He'd had one attack a week before, but nothing was found, and then came this attack with only Pat present, and by the time she knew something had to be done, he'd died.

So far, nothing has been found wrong with his heart. How strange. And how sad. A real field man, whose head and heart lay in the land, in the desert whirlwinds, on the remote islands, and with his animals for whom he cared so well.

I've changed reservations and will fly to L.A. from Honolulu on Saturday the 8th, attend the service on the 9th, and go home that night.

This afternoon, prodded by the need to get things done, Bernd and I went on the *Maka Ala* and tried the video camera. It works OK, even if the eye sees vastly more. We will be able to do things like sex animals if they come within 12 ft. or so. I could tell Bernd's sex from that distance. It does work in very low light levels. We had two stops left, and it was an overcast and dark afternoon. One can adjust it easily. It has stop-frame

capability. I think the motor is going to create interference of a serious port. It puts lines on the picture every time a spark plug discharges, I think. Not sure what to do about that.

We just missed the porpoise school, which left as we were getting underway.

I tried my plumbing and it was full of leaks. Oh my. Even half a dozen in the plastic fittings—now, why? Tomorrow is a holiday and I doubt that I'll be able to fix it, but I must by Friday.

September 2, 1979

Napoopoo, Hawaii

Bernd and I decided to try to get some video with the *Maka Ala*, and so we took her out after lunch. Just as we loaded up, the porpoises drove out of the bay to the north. But never mind, we photographed each other, and at various distances from the viewing port. Then we took pictures of tropic birds, told risqué stories into the microphone, posed and acted generally silly. This, of course was translated into a hit production back home, to cheers. Everyone decided I looked like the Emperor Claudius.

The pictures came out quite nicely, even though the light level was low. We had about two stops left on the camera, which indicates we can take pictures in very low light, and that definition is acceptable at some distance, depending on the clarity of the water. We'll keep at it. The ole *Maka Ala* rides very far too high in the water and needs ballast badly.

After that saga I went over to the house to work on the plumbing. Much, much to my surprise I had enough parts to do something to every leak, and with a little luck we may have solved some of them. We'll see. It was all I could do to restrain myself from turning the water on before the various cements had stuck.

Good raucous dinner, with a session after scheduling things.

Sunday is schedule night, and we talked about days off, scans, and the like. We developed a matrix for time off, some folks take Saturday and some take Sunday. The cook had plied us with wine and only Jody, who doesn't drink, was able to make any sense out of the whole thing.

September 3, 1979

Napoopoo, Hawaii

Today was joy and woe day. It's hard to tell which overrode the other. Bernd and I took our notices of our open house around Napoopoo, visiting various people and telling them as we came in the yard that we weren't salesmen, but that we had an invitation. We were greeted by fleets of dogs of all dimensions, including steely eyed ones that dared you to come on the porch, little yappy sausage hounds, many German shepherd crosses, some terrier types, whose grungy dispositions showed in their wiry hair and surly looks. But the people were nice. They listened to our tales, were interested, said they would come see and listen to porpoise sounds, and their kids perked up. We met the cross-section of Napoopoo, and what a cross-section it is. Herb Corneulle, the President, or ex of Dillingham Corp, out slaying crabgrass on a lawn that looked utterly crab-grass free, he looking like a Boston Brahmin with immaculate white hair, looking like he was ready for tennis; Koiko Andrews, a powerful hapahaole with his pregnant blond wife, who runs the canoe team locally. He asked us if we wouldn't please, tie a rock to Gordon Leslie and sink him. So much for that relationship.

Then we saw Mrs. Kamakau, a handsome Hawaiian lady in a lovely house, who welcomed our invitation, but said she would be on Kahoolawe. A large group, she said, was going there to work toward making the place a park. It's a Hawaiian thing. They still carry the kahili of the island in celebrations locally, even though it has been a bombing range for years and no one lives there. It is an aina, or one of the islands of Hawaii, and thus a member. I understand.

We asked her who to see. We saw a family whose head is a King Crab fisher out of Dutch Harbor. You can see why he is here. We talked to the wife who had gone around the top of Alaska with him, to the Mackenzie and Canadian Arctic Ocean. Then we saw the paddler; then we saw Mr. Johnson, who was actually a Johnston, or a Scotsman who traced his lineage back nearly to the birth of Christ, a mormon, whose floor was strewn with pictures of deceased relatives, busy on a genealogy. He waved us in, and for three hours we sat listening to him. He had been a hydraulic engineer at Cal Tech and Hughes. He had worked on two aircraft and had been here since the end of World War II. He had been on a troop transport just like me, urged prayer on us, talked about Yuri Geller, and was a sidekick of Gordon's, and then he hauled out *Smithsonian* of all things, with my article on the tuna-porpoise problem in it. Now that's validation of what we are doing!! He discussed the pics, the scots, the link between Japan and the Basques, and on and on. I can't recount it all, but after we had left, Bernd encapsulated it all: "He's absolutely brilliant, and absolutely bonkers." He did, however, tell us about Gordon, whom he describes as honest, a thing we found hard to countenance, and told us of his sensitivities.

Then we went down Leslie Row, where everyone was named Leslie—the women flaxen-haired and slim, the men darker, hapahaoli. All except Mrs. Henry Leslie, who is pure Hawaiian. She came on somber, and gave us a radiant smile for our invitation. Then we saw Mr. Shutte, who runs the Holokahana, which he had bought from Bob Leslie. He was a pleasant, rugged, haole guy who flinched at our mention of saving porpoises—he'd had too much trouble with the stenos, whom he called by name. They stole him blind for bait. What had been a profitable flag-line fishery was marginal because these porpoises wouldn't leave the fishermen alone.

We walked back, to be met by Mr. Johnson, who had been in consultation with Chris. Chris explained she was a Johansson and Scandinavian, so that was that. But, not before we were met by Gordon, and laid on with five violations of the building code where we left. Johnson urged prayer. He said one could turn on the shower to drown out the prayer, but that before we knocked it we should try it. Gordon's gig was with the assistant planner in Hilo, and he said it rather smugly, I thought, and then gave us a lot of sass, about the fishermen not giving a damn if the porpoises were saved since they stole bait. This in the face of taking the opposite tack yesterday when he was accusing us of chasing the porpoises out of the bay. We counter with a blessing and an invitation to everyone in the town to come see what we are doing.

Kim's typing. Quite a session, and maybe not yet done. [Kid's typing].

It was an experience. Gordon's bomb means that the planners in Hilo, who had wanted to help us, are now restrained by the rules. I'm not sure what it means but we will go to Hilo to find out. I'm morally certain that Gordon will be on our case, in any event. It keeps the days interesting when there might be only science to deal with.

In the afternoon Bernd and I took a nice swim and tested Jody's tape recorder case under pressure. Bernd had smoothed the O'ring and it worked fine. I had a face plate for the first time and enjoyed the swim greatly. I called Phylly and enjoyed that immensely, as I miss her, and changed flights around. I'll now go back on the 15th, since Pat has changed the date of the memorial service to the 16th.

September 4, 1979

Napoopoo, Hawaii

Well, Gordon lied to us, as usual. He seems to prefer that mode when dealing with us. I called Hilo and we have not been cited. They only want information. Bernd and I will drive over in an hour or so to see Bill Moore. And then I called Roger Evans in Honolulu and he tells me our Conservation Zone permit has been recommended for approval. And, out in the bay, Shannon and crew have been waiting for the porpoises to come in. They finally did, around Cook Point. Shannon missed getting right in their path. It takes alertness and speed, and luck. I think the latter was missing, but she did get into the school as it was subsiding into rest. So, things seem to be shaping up a bit, moving toward some sort of operational mode that we can live with. If we just keep doing our work while all this mayhem swirls around us, we will make progress. Otherwise it defeats us. We are working hard, and only occasionally does the frustration of bureaucratic problems sneak through to disrupt things. Later in the morning Melany and Randy will head out to attempt some video recordings.

Poof, I'm back from Hilo, all bushed from driving entirely around the island this afternoon. We had a nice meeting with Bill Moore and Wayne something-or-other—a very taciturn Japanese. Moore is hapahaoli, the other half Chinese—very big and tall and affable. We discussed what we had done—set the house up, get electricity and water at Gordon's suggestion, and then be hit for these things.

I laid out everything, including the gauge of wire we had bought, and they will check into things and give us a reading by Friday, when, incidentally, our permit for the Conservation Zone is due for approval. It seems that the two offices are not hooked together and what happens in Moore's office, which has already given permission, is not likely to mean much in the other office. If anything. Bernd drove much of the way, and wow, he drives fast and swervy. I was tired just from holding on. But we did the right thing, and the final disposition is ahead on Friday, I think. Randy and Mel hadn't gotten out because of rain, and then the porpoises left around 1 PM. Bob Leslie is sort of due for dinner now. He may or may not make it.

September 5, 1979

Napoopoo, Hawaii

We went out in the *Maka Ala*, Mel and I. The weather had been bad yesterday so no attempt had been made. It wasn't bad when Mel and I went out. The ole *Maka Ala* needs ballasting pretty badly, but she worked, and we were able to obtain some interesting videotapes of animals, and to begin analysis of wild school structure underwater. A school of between 50-60 animals was in the bay, usually broken into three groups. There were many young animals in evidence, some with presumed mothers. From below the surface we saw a few groups, two mother-calf pairs, and a couple of identifiable males. Our best runs were at quite low speed and especially in shallow water

where the animals dove and drifted below us in full vision. I have no doubt we will get plenty of value if we keep after it.

The evening was spent in going over the tapes frame by frame. Luckily the machine has a counter, and a stop-frame arrangement. The latter isn't too good in that the picture becomes vague when on stop frame, but usually we can make an approximately count, and can determine dispositions. We've a grid work that goes over the screen that will let us calculate inter-animal distances, and positions of snouts relative to one another. There are many problems, but we are begun.

I made a run up the hill to get some materials to fix the sunshade on the *Maka Ala*. At present it is propped up by two wooden slats held together with latex rubber tubing. I'm afraid somebody is going to be hit by flying slats or snapping rubber tubing. Then, too, we will build a little slate to photograph for each reel at its start, or for each new day and sequence. Just like the professional types do to identify their tapes or films.

We had primordial ooze casserole (quite good, I have to admit—broccoli, swimming in cheese and over rice).

To bed late, with Chris, who is an utter night owl, still looking at the first tape.

September 6, 1979

Napoopoo, Hawaii

Well, the saga continues. If we were only working on sociology, we'd have three or four dissertations already. This time our Avon 12-footer was cockaroached during the night. Taken off the dock, the anchor neatly removed and left, and spirited away, probably by water, and probably to the Napoopoo dock, and thence to where I don't know. But gone. It is a grievous loss in that Jody uses it all the time, and it's best for hauling heavy things. We prepared a report on it, including identification marks (there were many) and took it to the police. They seemed confident of finding it, but if it was taken in anger, I doubt that. It may never be used again. I called Warren Stuntz about it, and he seemed unperturbed, but didn't offer to replace it.

There are so many thefts, I'm doubtful that it was directed at us. It was big, available, and not tied down in any way, and could be taken by water without disturbing us. Bob Leslie had his house broken into last night, too, he says, by some young guy out of work.

The house is cleaned, the gals have made a lot of sushi, and will make haupia pudding, a punch, a fruit dip, and lots of cut vegetables. Should do. I called Leon Sterling and he will be here a little early on Friday to talk to me. Then we go over to Manini. I hope my friends Lehua and Ceci make it over. I dropped up to Sherwood Greenwell's office in the Kealakekua Bay Center and left him an invitation. I hope he comes. Jim Simmonds, our mechanic, will come. He's such a nice guy. That'll be enough by itself.

Warren, by the way, bless his prescient soul, set aside funds for seven months rent here, should we need it. Wow. We probably will.

What I figure is that we cheer every day we get our data, and every day get closer to our scientific goal. Damn the Gordons, full speed ahead. Bob Leslie, by the way, is very sure Gordon, or his pal, are behind this, though I am not so sure. Well, who knows?

I took Jody's cast-off mask (which works fine) and had a second lovely snorkel time around from the front of our house to the Beach Park. It was raining, chilly getting in, but once there, all one did was hear the patter of rain and feel it a little on shoulders

and back. The bottom here is rich with fishes of many common types. I saw several butterflies—*C. lunula*, *corrallicola*, no *miliaris* though, and some others, yellow tangs everywhere, olive tangs, and some others. *Gomphosus* of both sexes, lots of needle-nosed butterflys, and just outside the entrance we came upon an 18-inch flatfish, which was capable of flashing out dark spots in an instant. It swam quite gray, and once it landed it instantly chose a level of spots to shine out. The spots were composites, including some iridescent blue subspots. I suspect it is *Bothis*. Then we came upon two *Naso lituratus* swimming parallel almost eye to eye, vibrating the posterior body. The vibrations were not wide excursions, but just that, vibrations. The fish swam from us, and fled to another rock in deeper water, and when I went after them to look again they fled inshore, following one another. They led me over to the side of the beach at Napoopoo and there I saw two eagle rays (*Aetobatis narinari*) flying in the sandy turbulence of the nearshore waves. They blotted out, then faded into view again. I swam quite close as they rather majestically, with slow beats of their wings flew over the terrain, rising and falling in the waves. I approached closely enough to see the rings on their dorsal wing surfaces, typical of the species. They were perhaps two ft. wingspread, not large but beautiful. Shannon and I both enjoyed the scene.

Then we wandered our way over toward the sand again. It wasn't long before three magnificent awa swam in front of us—big milkfish, 2½ ft. long, powerful silvery bodies, strong forked tails, big eyes, and black pelvic fins. I followed them for quite a while. They never spooked, but stayed just ahead of me.

Well, the house is all clean, the sushi made, the gals are making leis out on the porch, and most of spent some time up the local *Plumeria* trees picking flowers. There are, I find, several kinds of white plumerias, and the rotate ones last longest. There was a rush on to get red ones so I scaled a local tree all full of orb spiders to pull down some prizes.

Bernd is down picking up Randy and doing errands. Pancakes for dinner. Seems appropriate and is clearly all we need what with the other tasks that need to be done.

September 7, 1979

Napoopoo, Hawaii

Well, it was a nice party and quite a few of the local folk came, though almost none of the Hawaiians. We did have some of Leslie row, who are married into Hawaiians, and Ceci came over with Roger, and Jim Simmonds came down the hill. It went like this.

First thing, I drove off in Winifred to pick up Roger Coryell and Ceci Lucy. They arrived in good time, were properly draped with leis by me, and off we went. Roger had brought along maile, and Ceci some ti leaves for serving platters. But my gals had all that together anyway. They had even made pretty new dresses for the celebration—nice flowered dresses in the Hawaiian style, with bare feet. Shannon, especially, was in her element. She knew all the proper forms, and how to make leis and haupia. Jody whipped up a very tasty dip for fruit, and we had a great bowl full of melon slices and pineapple, and then another of watermelon slices. The sushi was sliced and was very tasty. There was plenty, in spite of my usual worries.

Randy and Bernd assembled the electronic gear and all this was duly hauled to the field shelter. It had been cleaned within an inch of its life, and covered with pictures,

many of them Bernd's lovely photography. There were maps, diagrams of the *Maka Ala*, and a slide projector had been set up, and about 20 slides chosen of marked animals, transiting, the *Nai'a*, the *Maka Ala*, aerial behavior, and the like. We hung blankets over the two windows and used our new screen on the wall. It is really nice, and the pictures just fit when projected across the room. When 15 people crammed in, it was hot, steamy, and limited discussion and dawdling over the pictures to a minimum.

We had a sound station and a place where we could play our one roll of videotape.

People began to straggle in about 11 and continued all day. About 11:15, the kahu, Leon Sterling, showed up. He is a shrewd-eyed hapahaoli, but quite Hawaiian appearing. He used to be a cop, is mentioned in Mami Stover, lived in southern California, became a Baptist there, and is a quick man with a quip or a leveling remark to regulate the emotional flow of a conversation—very much in charge. About noon we gathered everyone together in the erstwhile bunkroom.

Sterling, a burly man, draped in maile (I had one and so did Bernd) spoke to us first of our responsibilities to the earth and to make our information available to everyone, especially Hawaiians. I suspect he may feel we are on some mission where this might not be so. This was good, and he spoke of a two-sided contract, of which we had as much responsibility as the local residents. Then he offered a prayer, his face fervent, his eyes closed. He spoke of this Friday as an auspicious omen, and of the wind as another omen. He mixed in the scriptures, and held a tiny bible or phrase book in his hand. He spoke of wilderness tabernacles with altars of dolphin skin. That made me think of the Ark of the Covenant and its dugong hide. But I forgot to mention it to him.

Then, after the service, I found him staying with us, long after I thought he would have left. He told me he liked the feeling of the place and the people. He told me of his attempts to steer young Hawaiians into education and jobs, when they told him it was easier to rip off a haoli now and then—no jobs, few opportunities, an alien culture forcing them away. [Invitation to event enclosed]

Though some thought he was probably opportunist, and all of us saw a way with words, a capability at manipulation of the social situation, I saw instead a very shrewd and perceptive person capable of bridging two cultures, and capable of seeing deeply into the psyches of the people around him, and further capable of asserting some degree of control through asking of those to whom he spoke for commitment. I saw a person who had seen very much of human nature, of trouble, and whose religion was a way of ordering the chaos in lives around him. He was facile, and to me, fascinating as a person of depth and great skill at treading a very difficult line. His job was to bridge the almost unbridgeable gap, and he did it with grace, and deep skill. It is easy to see how hard that might be when the anger of the Hawaiians against the haoli and Japanese is so deep. They are put down by us at every turn, by every evidence of educational advantage, by every little gadget we understand and they don't.

Anyway, I can't imagine having had a finer person come to grace our morning.

I took Roger and Ceci back to the airport, bid them fond farewell and returned to Napoopoo after buying a little food—some nice opelu, but everyone but me had been feasting on sushi and didn't much want a full dinner, so I cleaned and split them, and shoved them in the fridge. Several more folks had come after I left, including Mr.

Anderson, who went on and on about various things, and a couple of groups from Leslie row. All in all a full and a good day.

September 8, 1979

Napoopoo, Hawaii

Warren has guaranteed our rent here until the end of February, so no one can get at us—the state, or Gordon. Our permission from the state arrived today with a few codicels, and dated September 14th. We have to discuss with the Forestry Department a plan for fires, and the land folks may want to charge us rent. How much they didn't say. But now we may just leave the shelter up for a while using it as offices, and then ship it home. If we do that I'll try to raise money to have the Environmental Field Program buy it from us, for costs.

Anyway, Bernd and I went out with the video today. The swells were running quite high and the water became very murky before long. Even animals looming large were just in vision. At first we saw pairs and slow-moving groups, usually spread, in pairs or threes, and then when the animals began to move faster, we began to notice sexual behavior. Animals were seen belly-up, swimming slowly in company with another animal above. I saw a genital probe by one of another belly-up animal, and I suspect I saw intromission. Even as late as about 12:30 I saw a defecation and several times I saw us passing through trails of loose feces. There were several marked animals in the school—fore-nip, deep notch, and others. [Drawings]

Bernd took many pictures. There was an animal present with an open cookie-cutter wound in this position. We saw finger-dorsal. There were very clear groups of young, including quite small ones, and some traveling with adults. There were also adult groups. I saw fore-nip in a group with mostly juveniles.

September 9, 1979

Napoopoo, Hawaii

This morning Jody and I went out for a row-swim. That is to say I rowed the Metzler and she swam and made her noises to the porpoise school. A huge school was in—75 animals, I guessed. It was composed at least half of juveniles and young separated off into their own groups, usually with a scattering of adults. Fore-nip was one of those older animals typically with the younger animals. Female? Then there was the old-boys group, those with tall dorsals, finger-dorsal, flopper, an animal with the sawn-off fin and deep notch, and one with a lunate notch on the rear margin—all noted yesterday. I should note that after this group finally left the bay in mid-afternoon, another group came in not far from sunset, and swam around right off our landing, inside the boats. That's the first time I've seen that!

Anyway, Jody and I set out a'rowing. She had gone before in an outboard-driven tender. But that boat had been stolen so we had to settle for the little one. My main problem and only objection was the problem of a place to sit and row. I ended up doing most of it on my knees, facing the bow and rowing Portuguese style. I did have sore knees for a while, but that's all. Just outside the boats to the north we came into porpoises who were milling in the cul de sac below the Pali Transit site. Jody was at once amongst them and they cruised right by and under her within feet. My little presence didn't seem to influence them much at all, and I had them near me several times, too.

Then we skirted down the cliff and once again came into the school. This time I watched a group of animals, mostly juveniles, go by Jody on both sides; then the animals nearest on boat sides, perhaps 30 ft. away, turned toward her as she made her warbling, mewling call. They came in from all directions and seemed to stop when 10 ft. away or so, and dive. She said they zapped her with echolocation trains, and one came within 6 ft. She reported seeing a nursing young. Then, the *Captain Cook* came in and thoroughly disrupted things, running through the school and dragging them into her tumbling wake and taking them out past Cook Point. They finally came back but we never again had a really good session. Twice I had seen the animals attracted to Jody, and it seemed pretty clear. At other times segments of the school simply went by and under her as if not disturbed at all, and then later I wondered if the reason the school tended to stay far offshore, was avoidance of her. I told her she had achieved about the maximum she could expect when she couldn't keep up with the school. She had attracted them momentarily to her, she had not ever spooked them, and they had reacted to each other as is to be expected. They are schooling animals and ultimately will give way to the urge to follow and remain part of a school. What complexities must arise from being schooling animals and at the same time being of highly complex mind? That is a major puzzle.

At any rate we rowed back about noon, full of pleasure with the morning, and not at all scornful of the rowing mode—if only I had a better platform to row.

I snoozed, and wrote a eulogy to Tim Brown for Sunday, and laid plans for the week. I cooked dinner tonight—tuna noodle casserole, with some more broiled opelu, rice, salad.

We'll probably go the super 8 route for the *Maka Ala*, I'd guess. We are missing so much data. What we can see with our eyes is vastly greater than what appears on TV.

September 10, 1979

Napoopoo, Hawaii

The porps came in early, perhaps 75-80 of them, all the old actors and also the juveniles and young. There was fore-nip, deep notch, finger dorsal, the cookie-cutter-scarred animal (whose other side was grievously wounded with a huge, six-inch-scooped-out and tattered place on its tail stock). One with a bent fin (flopper?) was there, too.

Chris and I went out to the *Maka Ala*. After some hitches (I put the gas hose on backward and we forgot things—it's awful to be expecting this and that to be done for you and suddenly it isn't). Anyway, we went off in gin-clear water with Chris making happy, incoherent noises up in the bow. Her pictures weren't all that good but she saw a lot. At noon, when the porpoises are waking up, we saw mating again. Do you suppose porpoises were so civilized that they mate only when wide awake? Looks that way. There seems to be an absence of mating and/or sexual play after first arrival in the bay and then it picks up after noon, before the animals leave. Zig-zagging must be contemporaneous.

Anyway, the school went very close to the cliff at times—5-6 ft. offshore, swarmed all around two swimmers. It was easiest to cut up near a school where the shore or the boats were in the opposite side and gradually got closer.

I really don't think TV is going to do it—too poor resolution. Everything else is grand, except stop-frame, which wipes out detail badly. Of course, our old rig could be part of the problem.

Anyway, we were out until 2 PM—dry, hot, sunburned, and then came in to a new mooring, praises be. When the first storm arrives we'll bless that arrangement.

September 11, 1979

Napoopoo, Hawaii

Another day on the *Maka Ala*. This time I stayed ashore in the morning and sent Randy out. He, who did all that work on her, and her trailer, had never been on board for any length of time, and had never seen a porpoise from her. They took most of the rest of the movie films with a little rented super 8. We'll buy an underwater version and substitute it for the video. A roll of film, processed, is about what a roll of videotape costs, and we should get a lot more detail. There is a new camera, the Nautica, that lets one work just like with a Nikonos. Just jump in and photograph, surface, and reload with magazines that cost 10 bucks. It should be possible to get footage at various places in their activity patterns—including offshore, incoming, etc.

I couldn't stand it and went out after lunch to work with the porps and had the pleasure of watching quite a lot of sexual behavior, which seems to spring up about 11:30 or so, after a period of pair and trio swimming without overt sexual behavior. The sex seems to come with increased aerial behavior, too.

I was pooped and hot and didn't sleep much somehow, but I do feel the *Maka Ala* is going to do some important things for us.

September 12, 1979

Napoopoo, Hawaii

The aerial team went off and had an eventful day. Chris got sick over Mahukona and had to wait to Keahole to get off, a mess I guess without airsick bags. The plane, by the way did not have its generator fixed yet. I told them not to go up again until maintenance is in order. I don't like that outfit. It's set up for a snotty son, who hasn't a clue how to run a business. The pilot is nice—Sam Jones.

They saw *Tursiops* at various places and spinners clear down to Opoe Bay south of Milolii. Hurray. Saw them spinning.

Bernd and I went out on *Maka Ala*. He finished the movies, and then took a long series of motor-drive stills—it took nine seconds to do in a roll when the action was continuous. Then, about 10:30 I went below and simply observed and noted things into the tape recorder. It's not easy stuff at first—the language of dimensions and interactions has to be learned. And timing. But, we did see the switch from pairing and trio swimming in the rest period to sexual behavior in zig-zagging at 11:30. Aerial behavior was also a correlated with the rise of sex. Much caressing, probing, and belly-belly swimming. I saw the water just after a series of tailslaps. Each blow had driven a cloud of bubbles into the water that was 1½ ft. long and perhaps a ft. deep into the water. It occurred to me that these would be echolocatable, and that an animal wanting to know school dimensions could not only hear the sound but zap it with clicks and get a precise range. Spins and other aerial behavior probably make much larger targets of this sort. Since they are well below the sea surface they should be easily locatable.

I wonder if the tiering I see in the school is a direct result of viewing cone of the animals involved. They are staggered, and in echelon in such ways that animals can keep

contact visually during rest periods. Thus, the use of sound for school cohesion is obviated. It needs more observation.

Chris came in in late afternoon, still feeling a bit lousy and the others made it after dark for a chili dinner. Tomorrow is my last day here, and I'll take it on the *Maka Ala* trying to see if focal animal methods seem useful. I think they should be. I'm anxious to go home, but also pleased that data seem to be coming in now.

I'll go to Honolulu with Jody, see Lou Herman about my chapter, buy some clothes, and head for L.A. for the Tim Brown memorial on Sunday, and then home Sunday night to my FAMILY. . . Wow, that'll be nice.

September 13, 1979

Napoopoo, Hawaii

Last day here this time. The porpoises came into the bay twice and left, and right now it looks as if they won't be in. But if they do arrive, I'll go out for some single animal tracks. That is, follow a single animal in the midst of a large number and watch for interactions of various kinds. I'll pack. The heat is still here so I'll simply leave some clothes out, and then Jody and I will be off tomorrow morning for Honolulu, where I have a car waiting and will meet with Lou Herman about my manuscript in his book. I've had to revise in various places, because it has been nearly five years now that he has had my manuscript. What a nuisance. A good paper with things in it ahead of their time is caught up with by other work, diluted by chapters written by Herman himself, etc. I hate these edited volumes.

Anyway, I leave the project going pretty well. I do have concerns about their capture plans and have discussed them with Bernd. Mostly I want the work done without any public knowledge. It's a terribly touchy issue here and we mustn't be connected with any public view of it, especially here at Napoopoo.

I'll buy a few clothes for Tim's celebration, eulogy, or whatever one calls such a conclave in honor of a person recently passed on.

Then, Sunday evening, home.

February 9, 1980

Metaevolution began with learning. It allows the animal to respond to the environment, but regardless of the direct dictates of the underlying code. The response is to environmental variability too variable for the code to respond to. The end products between selection and behavior are congruent—individual survival.

Further, this frees the code of needing to respond to minutae. Such minutae, hard-wired, are constraining, and dip down into the noise level of environmental variation. Optimum fitness is achieved when a broad genetic plan, responsive to the broadest variability in the environment of the organism, is matched with a fine-grained response system.

What remains unpredicted are the longer term or broader controls that intersect into the ecosystem of the organism from beyond its range and beyond its lifetime, i.e. beyond its direct individual experience.

Enter conscious awareness. With it ultimately comes the ability to assess to some degree at least ecosystem state.

Our society now spends a large part of its activity in such assessments in the attempt to inject findings from them into societal direction. It is, at the moment, the ultimate extension of the organism and its code beyond that set of basic patternings. But, it has not in any sense escaped the code. The tendencies that allow us to reflect and act on our own fitness spring directly from the code. Determined there are the basic emotional features of socialization, of the associations that let us look at the domains within which our lives are played, that let us look off into the intricate murk of the intermeshing systems that form our world and that represent the ultimate restraints upon us.

March 25-29, 1980—Mojave Desert

March 26, 1980

The Bunny Club, Granite Mountains, San Bernardino County

Dick and I are wandering the desert during spring break, visiting mineral and fossil localities and laying plans for a new University Center at Snake Spring. Tomorrow we'll head north to attempt to line up a lot of materials for the construction at White Mountains Station, where our intelligence tells us lays an enormous and incalculably valuable junk pile.

We started out on Monday (it is now Wednesday), drove across the Paso Robles-Wasco Road and across Tehachapi Pass. We camped north of Hinkley in the Lynx Cat Mountains—a nice *Larrea* bajada but blustery and cold. We both had to come to terms with mummy bags after long absence. In the morning we whipped up elegant collision-mat-style pancakes and bacon over *Larrea* twigs. My, how I love that smell!

We drove N. into Black Mountain to look for rocks. Opal Mountain is banded with pure white tuff capped with volcanics. We had a couple of grand hikes and found a little opal (none with fire) and headed north again for Murphy's Well and Coolgardie. The latter is a mass of small mine dumps and tunnels in bouldery alluvium. Why, I don't know. There were quite a few shacks about, some with highly unfriendly signs: "Trespassers will be eaten"; "Honk three times or we shoot", etc. We ended up in the Superior Valley, an area of giant Joshuas, creosote, and grassland. The road finally took us full circle up against the boundary of the China Lake Navy Base (jets arrowing past) and then down to the Ft. Irwin Rd. We cut off to see Rainbow Basin, a varicolored badland of banded and colored sediments, some full of mammal fossils. We didn't find any but had a good hike.

Then Barstow—lunch, shopping, and gas, and on to the Granites. We arrived not long before dusk, cooked a nice meal of lamb chops and fixins and then to sleep. Felt good. Better than in a long time. Nice traveling with Dick, too. He's up for most anything, has quiet humor and lots of energy, and loves the desert.

March 26, 1980

This morning after Bruce Jenner-encrusted Wheaties, we headed for Snake Spring to check out the potential for a University Center there. I want to build one of stone that will take the pressure off the BC and provide more room.

The creeks there were flowing with clean granite water over green algal-covered stones and cascading out of north spring into potholes in the granite and sliding in long, dark bands down the naked rocks.

We traced pipes up North Spring, past the golden cup oak clump and the willow thicket, all yellow-green with new succulent growth. Probably 75 ft. above the oaks, the pipes went under a big, house-sized boulder under which the stream ran. It would be easy to dam. There's lots of pipe—hundreds of feet—1/2-in. black iron in fair condition, 1 1/2-in. galvanized in good condition, and 1-1/4-in. black plastic that seems OK. Enough here to plumb any new house we build and to bring water in.

We then traced the South Creek and went into a 15-ft. high grotto as big as a big living room. The stream bubbled crystal on the floor over phenocrysts and orthoclase. We found two petroglyphs inside—one the ladder-like motif, pecked in the rough granite.

Then, just east of South Spring, up against the granite face of the mountain, we came to a fine site for the center.

69840 Granite Mountains Bunny Club Mileage on Way Home

Dick and I went north and in the Mescals found a fine sandstone quarry—unsigned. One drives up an old road past a plastered shack, two Bonny and Clyde cars with their doors full of bullet holes, and up a steep, rocky hill toward the west and a mountain from which very regularly bedded sedimentaries jut. It's a quarry with no signs and wonderful flat red sandstone, some in sheets six ft. long. We'll use it for the Granite Cabin.

Then up past the Mountain Pass Mine. The road emerges there—then up to the Kingstons. I'm always amazed at the lovely nolinias, the talc mines splashing the hills with white. Up past Horsethief Springs we began to see the crest. I guess we were at 4,500 ft. and the crest, lined with trees and rocks lay two miles to the south and 2,000 feet up. Beyond what we could see apparently lay two to four miles of rolling ridge to the crest. At any rate it'll be simple, relatively, for our crew to reach the upper mountains. We cruised on down the rutted dirt road to the iron mine, on the north side of the road—great piles of talings cascading 800 ft. or so down a steep slope—magnetite we found.

Then at Crystal Spring we saw the University van stopped and walked up the hill. Out came Steve Raneau and Brad Bush. They thought we had come to chase them out! Together we went up the creek to explore. There is a talc mine as a series of levels and tunnels up the hill to the east. Three houses sit in the streambed and a flowing clear stream. Trees (cottonwoods and locusts) grow in the canyon.

We found a nice 12 x 5 cement tank overflowing with clear water (what a place to swim when it gets hot). One building had been built athwart the stream and a storm had filled it with mud. The other was in better shape. Up on a mine level we found nine 8 x 10 beams, maybe 20 ft. long. Great for the Field Shelter.

On down the road we went to the Smith Mine cutoff. We rocked and thumped up the entry road in the wash to the two houses sitting amid locusts at a little spring. There was Valerie Sumida, the planner of the group. I really liked her. She is so acute and bright and concerned. She saw many problems of BLM management that I had painfully come to.

Anyway their house is a galvanized roofed house with windows out but the roof apparently intact, a good kitchen and a couple of bedrooms. We cooked outside, Dick and

I, over a nice *Larrea* fire—broiled lamb chops that we shared, potatoes and onions and soup. I slept on a tattered old couch kind of leveled alongside the fire.

In the morning we headed out up through Shoshone, lower Death Valley, Bad Water, Stove Pipe Wells, over Tomues Pass to Keeler and Lone Pine and up to Bishop. We arrived at the White Mts. Station at 4:15, introduced ourselves to the caretaker, Don Boozer, and asked about possible supplies. What a treasure trove—weasels, trucks, aircraft tanks, wire, jeeps, and heaven knows. What a suspicious pack rat—not that I blame him. We *were* trying to get his goodies. But his junk had put the University in a fix with the forest service. I looked, was past everything and out. Dick and I made contact through Phil Pister with Rob Rainer and Joanne Kerbaraz, who were out catching wild sheep at Sawmill Creek. It was a circus. All sorts of uckymuks. Dick Weaver of CF & G and 20 more. They caught 20+ sheep with cannon [?] and apple pulp.

Dick and I had dinner with Joanne and Rob and then took a motel room in Big Pine, nearly fell out of our bunks at a Peter Sellers movie, and went to sleep all clean for the first time in days.

We traversed Saline Valley, pecking at formations and dun--- mines, met a colleague of Bob's, Jim Cushin? Hayward State, a grand-looking geologist with a flat tire, then headed up Grapevine Canyon toward Cerro Gordo Mine. We were stopped by snow at 8,500 ft. or so, and hiked nearly to the ridge, found crinoids and brachiopods and some other fossils in the [?]. The mines lay above us and I had to pry Dick off the mountain. He's so enthusiastic. We made it to Olancho after dark, called home, and headed across Walker Pass, up Hwy 5 to Pacheco and home by 3 AM or so.

Wonderful trip. Wonderful being with Dick and grand sights.

April 7-13, 1980--Granite Mountains

April 7, 1980

Upper Rich Bar, Kern County

The spring field quarter starts—30 of us—in the Blue Bus. A quiet crew, sleepy and trying to catch up. Down the road at dusk for dinner at a greasy spoon in Moss Landing and on to Paso Robles and over to Wasco and Bakersfield and thence to camp at midnight. Some sleep and then up.

Granite Mountains, San Bernardino County

We looked around us at the canyon, the trembling brown river, the bending willows and up the hill to the leaning digger pines—their delicate silver needles trembling in the breeze. I tried to recast the flora in terms of times past—sycamores coming from the south along with Fremont cottonwoods.

We watched the desert [?] long before we reached the crest of the pass. The Joshua trees came fairly early and way west of the crest. Junipers came in even earlier, near the lake as did *Artemisia tridentata*.

It was a fairly quiet crew all the way out to the Granites—it takes a little warm-up.

We caught our *Xantusia* up near the crest and talked about that for a while, keyed out plants, and drove on down to the desert. A stop at Barstow and then at Pisgah. The chuckawallas were out in force in the warmish day. I caught a big male and one of the gals caught a *Phrynosoma platyrhi*— and talked about color matching. Things are out. The air is dry and warm, but not hot. Otherwise, no horned lizards would be out at 4 PM.

Cheese fondue tonight and we got our musicians up in the wind scoop—a guitar and banjo. Don Usner on one and Tom Curts on the other. It works great—it projects the sound out and envelops the whole cabin. Tomorrow, observations. I'm a little low and hope the voltage picks up.

April 10, 1980

Bunny Club, Granite Mountains, San Bernardino County

Well, it's been a good day! As dawn streaked the sky I could hear the kitchen group up, stirring around, setting out the breakfast. I took out three groups on walks today and all were successful. The walks were leisurely strolls through the wash community, asking about this or that plant, peering into pools—the stream runs clear in some stretches and gurgles nicely in the jumble just before the pond. The weather has been spectacular—clear, blue, and warm days, with some times a little gusty breeze to stir the air. We inspected woodrat middens, peered under rock crevices at ferns and poured water on black patches of moss.

Moss is so amazing. I wonder if it doesn't promote dessication by the places it chooses on exposed rock surfaces. It must get very hot, probably well up over 180 degrees F. at turns. It seems like a pretty efficient black-body radiation trap—blackish fronds pointing upward toward the sun like a deep-pile mohair. I wonder if the strategy isn't to dessicate way down to the bound water level in dry periods. Somehow in such a state it is relatively impervious. Maybe it prevents a vapor phase from occurring—no gas can escape, or little from the free water, as the plant heats. Somehow, I'd guess the vapor disrupts cellular processes.

At any rate, in ten minutes after we doused one patch, it was gleaming yellowish green.

Then we crawled under a long north overhang, just high enough to accommodate me on the phe— roughened flat boulder that formed the floor. Back six ft. where the cap rock and the floor joined was a vertical wall of soil, dark with moisture. It was green with liverworts, golden-backed ferns, and the delicate little hydrophil, *Eucrypta*.

We sat and I talked about observation. One group clustered in the lush green grass beneath a spreading pinon.

One group tried to psych out ant mounds down in the arroyo below the cattle ponds. They are geometric structures with a smooth, equal-angled (or sloped) inner surface that I wonder about. Do ants respond to the slope angle? If so, mine were about 20-30 degree jobs. It looked good. When an ant bearing a little crystal found a depression in the inner slope of the mound it usually filled it, but if it reached the top it just dropped it, often on the steeper slip slope. But affairs were far more complex than that amongst the ants, with social interactions, and other ants wandering long distances on other missions that I could not penetrate.

The students are a warm, attentive lot with many individual talents—quite a special group, I think. As a group they're responsible, too, back on time, ready to go

when you ask. Larry and I sigh in relief when this emerges. The two or three ringers one usually gets are absent.

A little music and to bed with the spotted skunk pattering busily around the cabin. Once the cacomistle stuck his head up just below our banjoist, Tom Curts, who was up in the wind scoop. Cacomistles eyes are huge and glow from his tapetum.

I'm up on the upper bunk with a few students down below. Melanie Seacat is below and the skunk just ran across her and her pillow. "What was that?" she says. "the spotted skunk," I replied, but in 10 minutes she was asleep, unconcerned. Such savoir faire.

Soon enough, me too.

April 11, 1980

Granite Mountains, San Bernardino County

Today was Kelso Dunes day. We were up very early. Bets Norris had dropped in last night and accompanied us. We arrived by perhaps 8 AM. Clear and calm and with the bracing freshness of early morning. Not too much was out on the walk in but emergence was well underway on the return trip. For me it was an odyssey of hyperventilation. I was last up this time but not by a long stretch. The crew was largely out baking in the sun sans clothes when I crawled over the crest.

We assembled at the top while I caught my breath and then Tom and I regaled folks with the wonders of sand dunes and then the inevitable tumbling, sliding descent began. The mountain sang nicely indeed and we headed back for the bus. On the way we came across a sidewinder track. I tracked it the right way, all the while wondering if I remembered (J crosses—the mark of the rattle forward). We found him under a *Petalonyx* bush, coiled in partial shade, with sand over part of his body. I fished him out and demonstrated sidwinding. Then I tried to pin him down and missed one [?] jowel. I was able to retreat and do it right but it was closer than I like—once a year is all I'll do this. His venom dripped yellow to great intakes of breath by the students. I showed them accessory fangs (he was shedding and replacing both front fangs), and then the loreal pit. Then, I put him back in his bush. He crawled off yawning at all the sand in his mouth.

Larry took us to Kelso so he could make a phone call. We lounged on the lawn and were served at the Café—I'd thought they were closed to the public.

Then back to the BC. After lunch I took out the last group. Maggie Fusari had sent a message of triumph for my ascent of Kelso Dunes "Pretty good for an old geezer in the age of Philosophy."

The cook group went with me. We sauntered along the wash at the base of the mountain looking at this and that. Then we sat under a pinon tree in a copse of green grass with the desert breeze rustling in and out. We had a nice talk and then moseyed off to the pond and down to look at a rather reluctant male Anna's hummingbird. It did three courtship flights and then we watched it on a *Yucca* perch. It was probably frightened by this invasion of intellectual talent. But we had a nice time, and I think everyone felt good about it.

Square dance tonight. Hard to do, but successful. A few boxes and tables, orchestra in the windscoop.

Two skunks got in a tiff and one became stuck in a cardboard box. Each time they squirted a little—not a full-fledged blast but a petulant puff. It wafted out soon enough though and it was strong at the start.

April 12, 1980

Granite Mountains Bunny Club

The cooks were up at dawn—the red light lit up the deck and tinged the beams. I didn't want to stir. Sleeping inside means one is last to have the light out, so it was late last night.

I was sleepy in spite of two cups of boiled coffee and slept in the bus after we checked out the UC site (for the field center). I woke up about the time the trash was dumped at the Kelso Dump, and again, when we entered Cedar Canyon. At one point San Geronimo loomed up 100+ miles away with the entire Kelso dunes in the middle ground.

Up at Hole-in-the-wall almost our first sight was of three bighorns—a ram, a ewe, and a lamb up on the top of the lava mudflow deposits watching as warily. The ram stood up and never took his eyes from us. The lamb is very different from a domestic lamb—very wild-animal-like—long, boxy nose, and very pale short fur. They finally sauntered off along the mountain slope unhurried and unfrightened.

We hiked down the Hole-in-the-wall trail (I'm writing this with the spotted skunk under the opposite cover of this notebook eating falafel dressing off my plate, not eight inches from my writing hand—then he came over and smelled the tip of my pen and went off to the sink—he has such a flat weasel head and little black button eyes).

The hike at Hole-in-the-wall was rather uneventful other than the desert bighorn—we looked at *Ferocactus* trying to understand how it defeats predation from rodents, climbed the chemehuevi trail and came down the other side and then went off toward the petroglyphs at the road that cuts along the south side of Hole-in-the-wall.

Janey Belknap badgered me to go for a hike locally and I had demurred because my knees were sore. I finally capitulated on a shorter outing, and six gals decided to come along. After breakfast and after Larry had gone off to scale Granite Peak we headed over the fault valley that slices west just N. of Cove Spring. It runs up a boulder-choked canyon and slopes to a saddle where the boulders became more scattered. We followed a clear, gurgling little creek up under the boulders. It nearly reached the saddle and way up there in an alga-streaked pool was a red-spotted toad.

As we climbed we gradually changed the flora—*Garrya* came in, its tassels not yet out in flower, and *Quercus chrysolepis* came in.

I think I saw *Amelanchier* but am not familiar enough with it to be sure. *Pelaea* forms were common under rocks as were golden-backed fern (*Pityrogramma triangularis*, and the hydrophil *Eucrypta*.

Out away from the mesic boulder-stream area we began to see mound cactus, fishhook cactus, and more common species. I ate the chile off one fishhook cactus. *Eriodictyon angustifolium* became common—an almost chaparral-like element.

All along the upper third of the climb we followed a dike of quartz and fault gouge. The crystals gleamed and glittered and we couldn't resist putting this or that bit in our pockets. On over the crest we went—me, Julie Perrochet, Joan Beatty, Janey Belknap, Judy Ward, Trevelyn Houdi, and Sandy Perscheid—a fine crew. We had a lot of fun along the way.

Beyond the saddle lay the upper valley, an almost rectangular depression fed by two streams from the palisaded rock cliffs above. Down into it we dropped, stopping to munch apples and oranges while sitting on the pungent duff of pinon, a circle of green succulent grass. Down we went to the clear gravelly stream. A bobcat had walked the creek, big-footed, and we argued if it might be a mountain lion.

Carex lined the creek before it narrowed into another boulder-choked canyon, opening again below in a beautiful little valley before largely disappearing amidst boulders as large as small houses.

It was rock-hopping all the way to reach the alluvial apron near Granite Cove. All this is on the University Section 17—a kingdom of little hidden valleys, great towering palisades of smooth and fissured granite. At the bottom we drank from a clear pool, inspected both petroglyphs and pictographs and trekked for camp.

Not a snake did we see, aside from a cast racer skin. Birds aplenty, though, including Sandy's first *Phainopepla*. She, by the way, is now Sondra. She had told me to fall into her arms when I was having trouble on a rock. You can image what I did with that—a towering continental affair between us two.

We took a quick cold dip at the pond and thence to camp. Then Glen, Tom, Julie, Janie, and Joan helped to empty the outhouse pit and bury it, a noxious task, but not as bad as might be imagined. The biggest problem was to keep from tipping over the full wheelbarrow on the way down the trail. We made it and balanced the house again so its door opened.

A few others were back but Larry and crew straggled in around dusk. They had split up, dammit, and gone various ways. One group of Don, Kim, Dennis, and Gretchen took another way down and came in after dark. I told them I was glad to see them but ticked because they had broken my rule about not changing hiking plans beyond what is needed for safety. Then I told them I'd stay mad three minutes. So we went on to nature notes. Pat Murphy came out with a few needles of what is almost certainly the first white fir seen on the Granites. It came from about 6,000 ft. near a ledge with a pinon tree alongside, on the Cottonwood spring side. Pat said it contrasted strongly with the pinon and was six ft. high with branches only two to three ft. long and only tufted with needles. What a find!

Dinner, notes, and everyone is off to bed. We leave early.

May 6, 1980--Big Creek

May 6, 1980

Big Creek Reserve, Monterey County

Off to Big Creek for niche hunting. The blue bus appeared about 7 AM at the Barn Theatre and packs and all we crammed in and were off. I was mildly dazed from too much paper work and jammed schedule. But the trip will revive me. They always seem to.

The weather is beautiful, clear and mild, and the hills still clothed in green grass and the flowers are out in some splendor.

With Larry at the helm we bumped along, stopping only once for a sermon on geology. It wasn't too lucid, I'm afraid. We loaded the jeep with willow poles for the

sweat, and a lot of other general camping gear. Then we swung our packs on and hiked the 1+ mile to Redwood Camp. It's so clean and nice and handled our 30 students easily enough.

I released everyone to find a critter for the niche hunt.

Larry and I went up to the University Center to pick up some tools and cabinets for Boronda Camp. The cabin was occupied by two girls, Laura Patty, and a gal from Sonoma State. They were watching gray whales from a grassy knoll S. of the cabin and maybe a few dozen feet lower on the slope. It was a great observation post. One could easily watch them come into the kelp beds below. Two mother-calf pairs came in while we watched. Laura said they had come inside the kelp and that they had seen a baby mouthing kelp. They thought they had seen nursing and perhaps adults mucking in the bottom. We warned the gals about fire. The University Center is deep in grass and the road centers, too. Fire hazards are rising. We close the reserve in three weeks. By that time it will be dry as a tinderbox.

I worked on clearing for a sweat lodge our aboriginal groups wanted to hold, down by the crossing and next to a deep cold pool. I ate early and they sat at the fire circle by a fitful blaze. Our wood seems wet and the soil is soaking. Then off to bed alongside the rushing waters of Devil's Creek. I'm atop the old debris pile from the shake makers who once worked this grove.

Once I was arranged in the crannies I slept hard and long.

May 17-18, 1980--Matolle River

May 17, 1980

Matolle River near mouth, Humboldt County

All arrangements are made. Larry called New York and finally obtained permission to camp on our little bench by the N. mouth of the Matolle. I took my truck so we could haul enough boats for this big crew.

The trip up was through uneventful sunny weather, except that the truck brakes got hot above Ettersberg and they had a fairly close call stopping, I am told. I was pottering happily along in the little truck, away up ahead.

The trip across was made easily enough and camp set up by dusk. Offshore, a bank of fog ran down the seashore, standing threateningly and up on the wooded mountains across the stream a cap of swirling clouds moved over the hidden peaks. But, it didn't come down. Instead it dissipated and the entire trip here has been beneath clear spotless blue skies.

Everyone was tired so we didn't do any presentations but merely gathered around the campfire, gabbed, and went to bed. Stars!

Three Dr. VanDenburghs had graced our arrival, each more magnificent than the last, and finally an anticlimactic one in Petrolia with a tiny white beard, a Chairman Mao hat, and blue mechanic's clothes on. We figured because he had a tan truck it would be dry, his magnificent white beard—protection, and his blue clothes, a fine time on the water.

May 18, 1980

Larry and I escorted the first party up to the bridge below Honeydew. The river was a bit lower than last year and will take longer, so Larry and I decided I'd meet them at the Petrolia bridge if it passed 6 PM and they weren't at camp. They weren't so I drove up, almost to the launch point, and finally sighted them on the way back, above Petrolia.

They were ready for a lift, all except the big, 20-ft. canoe that went on. The dinner was ready—fondue and fixins when we waded across to camp, and a nice big fire.

I'd spent much of the day snoozing off a kind of flu that has me aching and logy.

My turn on the river, this time we cut it a little short by starting at the A.W. Way Camp. My crew was Julie, Flora, Judy, Sandy, Amy, Carol, Roy, Don, Alisa, Joan, Megan, Rena, Dawn, and Glen—a rum crew. We had a fine time, in the sun all the way. A blue heron paced us, we swam, banged into cobbles, went in circles with inexperienced oarsmen (and oarswomen). The blue raft dragged beyond the others—it can hardly be rowed at all. But we won out, over songs, swims, conversation, occasional flashes of tension and fear as the rocks or trees loomed up ahead and we seemed so close to being unmanageable.

I rode the last stretch from the Petrolia bridge with Judy and had a grand time on the river down. She's a good person with the oars even though inexperienced. We popped an oarlock but converted to a steering oar, which actually worked better!

Our crew caused quite a stir in the Hideaway bar—Petrolia—Roy and me and about 10 gals. We were invited to a dance (I was an accessory to the fact) and general good feelings abounded, plus free beer on the house. The dance we will pass up because people are behind on their presentations. Julie explained the geology, though, and I gave a thing on rivers and their wisdom, point bars, gravel riffles, and the like.

We tried a new thing this time—looking at physical processes. It worked well, the structures of streams, bars, sand, mudcracks and mud. People really did well, trying to psych out how these things work.

June 5-8, 1980--Tuolumne River

June 8, 1980

Thoughts on the Tuolumne

One knows one has arrived at trust when people begin to sing girls' camp songs. None are sillier, and when they can be sung one after another in perfect security that no one scorns, then that is trust.

Hiking concentrates attention on one's feet, on the trail just ahead. All sorts of otherwise unnoticed things go on there. Tete a tetes between tiny wasps, a magnificent gleaming metallic-green bee startles and bumbles off sleepily as if flying with only one arm in his flight jacket, running into a grass stack. Ants cross, one nearly obscured under its treasure of a whole caddis fly casing.

What *is* butterfly business, anyway?

Digger pines are leaners. One of my students called them "drunken pines." I thought they might do it to avoid shading as very young trees, but no, I found a leaner growing from a crevice in a huge boulder where it could never have been shaded. No, I think they probably avoid shading themselves.

. . . all innocent, a lustrous poison oak frond leans over the trail bending it in a sharp U. . . .

June 5, 1980

Rules for Modern Field Class leaders (cont.) [the beginning comes later!]

11. Lovers get in trouble.
12. Lovers pay no attention.
13. Groups need, at first, to be alone to find out who they are, to dissipate fears.
14. Care for the individual process of enlightenment not some goal.
15. All water is one inch over your boot-top (Backer's law).
16. If you have time, build your group as a place, an entity to which people can belong. In time it can become a bulwark against the placelessness of the outside world.
17. Jokers are good in modest quantities.
18. Trust unlocks the heart and mind. For a person to know his or her personal space, integrity and ethics will not be affronted, allows them to release themselves tentatively at first, to the trust of the group. Then unburdened of such fears, the mind opens to all possibilities.

. . . a fat utilitarian robin flaps by. Somebody seems to be shooting down deerflies this morning, like Messerschmidts over London. I've seen three that couldn't fly including one grizzled old giant with one front leg missing. He climbed the tip of my walking stick and then fell heavily into the grass.

At noon, under arcing oaks, the trail is dappled with light and shade and shingled with tan leaves.

Life is made of interludes, of streams that swell and then usually wane, or spread like spreading rivulets on a delta. Our group this spring has been one such. Tentative at first, it grew in trust, and then, in anticipation of an end, each turned a bit inward in wordless sadness that this precious place, this trusting enclave, was to reach its delta, too.

June 5, 1980

Early Intake, Tuolumne River, Tuolumne County

Time, this spring, has passed like the swift Tuolumne. I guess we all wish we could wander another few thousand miles together. There's so much to see. Being a naturalist is one of the most fulfilling of occupations since there is no place on earth without fascination.

I know without being told that most of Larry's and my hopes for you have been realized. We wanted to parade the natural riches of California before you so you could see firsthand, and examine in your own terms the remarkable diversity of this most diverse of states.

We wanted you to have fun doing it. I know that joy and the child's playfulness are keys that can unlock the mind. Part of seeing is caring. No person can really be successful plodding away at the edge of knowledge as a duty and a labor and at the same time expect fresh insights to come. What could be more fun than floating belly up in a cool cauldron of finest Matolle mud, slathered from stem to stem with glistening inches of greenish brown gooop, with only eyes showing!

What could be more fun than slurping barefoot around Boronda meadow in the rain, singing and digging tent trenches.

We have, it seems, run to mud as our official substance. Then, think of that delicious day on the Matolle, with Flora (or a reasonable facsimile) at the helm trying the wholly new rear arc approach to snag passage.

Or why does just hiking with or listening to Sondra make you silly?

I wanted each of you to surrender to that best-of-all educational adventures, letting the length of personal intellectual passage measure the worth of experience, rather than setting up some concocted standard to be sought by all.

Each of you, I like to think, has been taken along a trail of some personal realization, some unfolding of mind or spirit in our intimate encounters with nature.

I wanted many windows to glint in on your minds, not just the structures of science. To look through just one leaves a person one-dimensional. Some scientists I know are so solemn and self-deluding about their work, that they live with the delusion that no emotion touches their productions. Foolish folk I say!

Surely they must see majesty in the insects or flowers they study, the perfection and economy of design, the fittedness of color.

Who could view the lichen-splashed boulders of the Tuolumne rising like schools of whales and porpoises through the sloping grass fields and not see the consummate artistry of form, shade, and texture?

Who could cling to a narrow perch on a granite wall and watch swifts arc and oolplane down those towering airy gorges of apricot morning light and not feel a little less arrogant or omnipotent?

I wanted you to glimpse the overwhelming intricacy of nature and by mind alone sense the thrumming wholeness of life in this canyon.

I wanted you to know how little we really knew, and perhaps to reflect that the Miwok before us knew about flower landing platforms and bees, of afternoon canyon winds, and felt linked to all that was around them.

About all of deep importance they may not have known was the land beyond their tribal holdings, the spinning globe in its wholeness that adds a new dimension to how we must think about ourselves.

For me the journey has been rejuvenation, a glimpsing of many things I've never thought or contemplated before. As by a projector being adjusted, you have all come into focus as caring people of remarkable and varied talent. Larry, all spring you and I have traveled in the company of princesses and princes. I put the princesses first because there are more of them, and we have to watch our step.

I know I am deeply fond of you all. Hit the road and wallow in the lake mud and climb the plateau and then help me build the tree house, a motel 80 ft. off the ground with no visible plumbing.

June 5, 1980

Thoughts on the Tuolumne

The resonant drum of my boots on the dark forest trail.

Water sapphires lined up in a leaf fold.

Gray-green lupine stars.

Out from a dark crevice a fern bends and reaches for light.

Spilling cascades of auburn lichens on the boulder face.

The life on the ancient manzanita pours, flows, and twists in mauve streams around the ancient dead and silvered arms. The living river branches to pass on both sides of a long dead limb. It piles in wrinkled folds like syrup over partly hidden burls. On each branch the silver is edged with black strand lines of the retreating living band.

A boot propped in a low crotch for support peels the mauve away revealing a glistening, moist, yellow-green patch.

One cannot look at a buckeye tree in bloom without thinking of a candelabra. Each is set with fifty or more white and yellow tapers curving up from the canopy.

A great somber Goya boulder rose along the rocky trail, painted in black and gray with splotched lichens. Dark clefts sliced along its face and beneath it a stone-roofed cave led inward to blackness.

Why do lupines balance rows of water sapphires in their folded leaves? Why does the dew gather there in little shining spheres?

I should think that digger pines would drive fire lookouts wild. They look so much like plumes of insubstantial gray-green smoke rising from the hillside.

The trout riding the bow waves of submerged boulders, or gathering in thin rear eddies like boys riding bicycles behind a truck.

Watch the world slide by, swirling patches of foam casting moving shadows or focusing little playing beams downward through curved bubble surfaces.

Twigs, alder cones, little insects caught in the film move by. The movement is ours and the trout's, but does not belong to the insect being swept slowly, twisting and turning along.

Where the slabbed boulders jut out over the stream, waves of reflected light dance and intersect like smoke blowing away.

Manzanita sets its leaves on edge. Out there in the high light it's probably important not to provide canopies for the rising heat.

The slanting sun sets the forest alive with light. A clear yellow coreopsis nods brilliant heads against the dark rock. Alder leaves look as if lit from within, hanging over the olive stream.

I lay my fresh-caught trout on a rock. Ten minutes later the bag was swarming with ants hurriedly seeking ways inside the bag. Such imperative message there must have been, sending ants pouring in hurried ranks from their underground works. No single ant rushing back to tell the others of this giant windfall could have roused the rest as they obviously had been. No, more likely a message on the wind swept over their coned entrances and many were set in motion at once.

High cirrus passes in diagonal rows athwart the wind. From my east-west cleft in the Sierra, they slide constantly overhead. Below them, and not far above the craggy canyon rims, gray and white cumulus, trailing veils, swirl in the opposite direction, probably driven by winds that catch and swirl around the [?] peaks beyond my view.

A cracked, diked slab of gray-banded gneiss forms a stone platform along the dark, deep river. For river and stone to meet is the most immediate of newness. That stone had its genesis unimaginable millions of years ago in some sea and sliding beneath a continent of lighter rock condensed and pressed into those bands and only now, have winds and water stripped down to it, so that in its ultimate moment of existence water

insinuates into it, pulling it apart again to tumble in chaos to the river floor, to be rolled, ground and tumbled till it's no more.

So many adaptations are deeply systemic; so few, on analysis, seem to even approach being unitary acts in nature, conferring this or that specific advantage to a plant or animal. Each change, instead, finds itself in an almost infinitely complicated sea of interlocking relationship both within and outside the unsubstantial boundaries of the organism. Doctors with their specific pills for specific symptoms could do well to ponder this.

The digger pine across the grassy field in front of me looks like a column of unsubstantial blue smoke. Why bluish? It's like so many desert plants. Bright-green chlorophyll partly hidden beneath a lighter bloom of cuticular waxes or other compounds.

A balance has been struck, here in the Tuolumne and also on the desert, between racing the sugar machinery and how much water it costs. Diggers opt evolutionarily for a slower food production to conserve water. With this option comes a color that prevents the digger from living in shade. With it comes the need to deploy foliage so as not to shade needles farther down the tree. It becomes wispy, and light filters through almost unimpeded. Its needles and branches are constantly mobile in slight winds, shuttering the falling light through the plant. It has taken a systemic path and can now find a modest place in hillside and canyon. The silver or gray plants of the desert are no different, except in detail. They too have struck balances involving a profligate light source with side latitude for evolutionary play, while to them water is a precious resource to be fought for, traded for, and sequestered like the most precious of jewels, and given up with deep vegetative reluctance.

Mosses and lichens amaze me. Many choose the most exposed situations to live and then taunt nature by being fuzzy, textured, and in shades of black or gray.

To be black and fuzzy on an open rock face is to trap the maximum sun in a place of great heat. Rocks in summer, after all, may grow so hot, one can cook an egg on their surface. Then, the moss, crisp and black, breaks off brittle on one's pants and socks, as apparently dead as any fallen branch beneath an oak. Not a bit of it! Pour a cup full of water from your canteen on a moss patch and within a few minutes the fronds have swollen, beginning to curl outward like huddled Bedouins after the sandstorm has passed. Emerald green is revealed from somewhere in the black mat.

Is it that it is dangerous to be partly moist? I'll bet so. I'll bet the plant must pass as quickly as possible from one metabolic state to another and that whole circuits of machinery must shut down in minutes or hours as the plant crouches again, hides its emerald, and goes black. Then, its internal machinery in a new state, it crouches again and waits.

What is the transition about? From what to what? What part of full life lies in slow process in these black, crisp fronds? I'll bet it has to do with free and bound water. Free water is a mixed blessing. At its lower temperature it turns to ice, spearing and swelling cellular parts, rupturing walls and delicate intracellular strands, bodies, and chemical chains.

At the upper it boils more and more rapidly to vapor. Such vapor may be as destructive as ice. But some essential water may be bound chemically and cannot at rock temperatures be converted and lost very fast.

I suspect that transition is involved and that the moss promotes crossing the barrier as rapidly as possible, shunting then to a new state, marking metabolic time as the slow processes allow when water mates with other molecular things.

Norris's law: Pay attention to the state of your ass, I tell my students. When it goes to sleep, it's time to move. The moral is to observe well. Your body should intrude its messages as little as possible. Be comfortable to see best.

Rules and Observations for Modern Field Studies Leaders:

The slightest girl—the one you worry about, is apt to be the strongest.

Drinks on the ground always come to grief (after Ferrisy's law).

- 1) Never embrace a girl with her clothes off unless yours are on.
- 2) Sex divides.
- 3) Little and big kids both have attention spaces.
- 4) To see out one must be in inner peace, both emotionally and physically.
- 5) Nature could care less.
- 6) Embrace both boys and girls.
- 7) Take the rain with as much pleasure as the sun, but to do this Law 4 applies.
- 8) No one can stand being profound more than 20% of the time, nor can anyone stand a person who is profound more than that often.
- 9) Say thanks for back rubs, but don't rub back right away.
- 10) Orchestrate chances for people to see for themselves and not [?] for you to tell them what they can see?

August 11-September 1, 1980--Kealake'akua Bay, Hawaii

August 11, 1980

Kealakeakua Bay, Hawaii

How does one learn about the social relations of wild porpoises? The chances one has of seeing anything are fleeting, little camera flashes of animals swimming. Usually there are so many animals that one's attention is torn apart, just as fishes in a fish school tear apart the attention of their predators. We are predators on understanding, and mostly we starve. Well, two major things go on. First, one learns to push aside the confusion by looking at one thing, seeking answers to one tiny question amidst the jumble of events. Do the resting animals travel with their bodies staggered or are they abreast? Thus armed with a question a tiny fact emerges. Nearly always their resting groups are in echelon, staggered, snout tip to eye. Ah, but when they arouse this pattern changes. Many times, these animals travel abreast. Then we ask another tiny question. Do resting animals touch one-another? Aha. Mostly they do not, but often they swim with pectoral tips inches apart. Do waking animals touch?

The second thing we do is be cautious opportunists. Not having clean sequences to deal with, we gather hints from anywhere we can find them. The captive spinner porpoises at Sea Life Park Oceanarium are a rich ground for us in spite of our clear knowledge that, much, even most things in the lives of these captives are warped by their confinement. At any rate, the three animals no longer on public display occupy a big

disc-shaped tank with an underwater viewing room on one side. We watch. Sure enough during midday, these animals swim in echelon, mostly not touching and later they arouse and move into caressing patterns. For much caressing, especially mating or pseudo-mating (for much apparently isn't directly reproductive), animals abreast, nose-by-nose fits together better.

Question by tiny question we tear at the chaos and the regularities of these porpoise lives begins to emerge. Cautious of the circularity that threatens if we move too fast, we begin to recognize "rest" in an instant; one of those little camera flashes will often do. The guide posts have become slow movement, echelon, not touching, a general lack of sociability with no, and almost no sounds. We learn they rest best in shallow water over clean sandy bottom, and always near midday. A step has been taken, a block has been laid down. The tiny questions focus more tightly. We see descent into rest as gradual and awakening as rather abrupt.

In like fashion the sophistication of other parts of the lives of these porpoises builds. School geometry emerges as a fluid system providing a place for all things in a porpoise life—a dynamic and subtle geometry quite directly molded by events. Fear coalesces a protective structure as we learned from swimming with porpoises in tuna nets, but mostly in the calm bays where we encounter them most that structure is not very evident.

The rules of this circular observational game are 1) watch the chaos at first until you begin to suspect regularities. 2) Then ask a small question. 3) Check that question with nature because she holds the truth, and no matter how much we wish, or how hard we imagine, we don't. 4) Probably this new look will modify the original question. 5) Look again. 6) Then, piece by piece, a turning of the observational wheel [?] regularities will begin to emerge that we can count on. 7) Then we go back and ask how we can demonstrate this or that regularity to our colleagues. What table or graph will show what we have seen. 8) Often enough such pointed quantification will in itself pose new questions or reveal new things.

All this is well and good, but as my colleagues, Chris and Rachel gently point out, the glimpses we get are so fleeting that we must modify our observational process a bit. Instead of a single question we must carry with us a number of questions simultaneously, so that we do not waste all our days waiting for a chance to check a given idea. When babies are in view it's perhaps best to have a baby-related question ready to ask, and then, once the baby has disappeared be ready with questions about spacing, or sensory geometry, or turning. So, the process I see, and what I've been following pretty much is first to frame observations in terms of the cycling daily pattern and then be ready with a series of specific things to ask. That is, most everything seems to shift according to the time of day, a time for feeding, one for traveling, one for descent into rest, one for rest and wakening. Then in that frame to ask things about, for example, relationship.

The process of discussion here at camp becomes important. It's where we transmit things to ask to each other. So we talk over the dinner table and frame new questions and talk of mini-triumphs.

Even though we arrived (Phylly and I) on August 3rd, I've not gotten organized enough until now to begin detailed daily notes. I've been tapering off other duties—Maggie Fusari's dissertation, student papers and notes and other concerns. The boats haven't been wholly ready nor my use of them, nor have I or Phylly been able to take the

full sun. So we expose various coated parts, learn to use the Zodiac as a photographic platform (I've fixed a line on her side that I can hang onto.) Randy prefers the bow but that scares me. I worry about sweeping into the screw. We've been putting acoustic feedback apparatus on the *Maka Ala*—a small hydrophone in a plastic conduit, bolted onto the false bottom of the vessel. It is shielded from the rear to cut down motor noise and the plastic greatly reduces water noise over the receiver itself. [Drawing.]

The *Nai'a* is out of the water. Randy put a coat of paint on her bottom today and she has her engines tuned tomorrow. One of our outboards is out of commission (off the Zodiac) so we use a spare 15 hp.

Phylly, Paula, and I took the Zodiac south today in the morning, hoping to find a chance to photograph with the Eumig in clear water. The clear water was there. I think I could see 100 ft. down, but we saw only five porpoises. They were all adults and were skimming around Palemano Point into K Bay as we went south. We photographed them. One had a subtle but clear fin mark. No other animals appeared save a beautiful 7-8-ft. span manta ray in Hookena Bay. We slid over its jet-black shape in maybe 60 ft. of water. It flew beneath us maybe 6-10 ft. down and then tipped and flew away. I had several extended views. I could see its palps reaching forward, lined on wing margins with white. A magnificent animal. Before I could ready the camera it was gone.

Both Phylly and I returned a little cooked but not seriously so. We slathered ourselves with aloe cream with Vitamin E, which works wonders. My birthday today, complete with wine, a real coconut cake, a nice dinner (chile and salad), and two gifts—a walking stick for my collection of coffee wood, and a cap with ram's horns. If I can control my horns all will be well—they flap a bit.

Tomorrow we're off—one group in the Zodiac, another in the *Maka Ala* and Randy to stay home and tinker with the decade[?] attenuator and our Sony tape recorder and to hope for a check.

August 12-15

We've settled on a schedule now and go out in either *Maka Ala* or Zodiac to make recordings of behavior or film from the side of the Zodiac. It goes pretty well now; quite a number of films have been made, the best down by Hookena where crew including Phylly found a school that then encountered another school, and they were able to record it all. On *Maka Ala* we have some good sequences now on various behavior during descent into rest. Long tapes have been made in commentary, including stories about mother-young behavior, interanimal spacing, the reasons for frequenting sand (dark sharks will not be visible even far above dark coral).

Paul Breese and Mary Lew have been here and we had a grand time with them, then Pat Brown and Bob Berry, and Pat's mother and daughter Cathy have been in and out. We went to a luau with them up at the Keahou. There were some evident stresses in that group—Cathy not happy to be out here with grownups and wanting to find some good boys her age. She did too. Looked happier.

All in all, through the flights of visitors we do seem to be producing some good usable data and I'm much more satisfied with what's been coming out of the underwater than I expected to be. With a few more shots at it we should have a lot of stuff. There are more than 50 rolls of film now, and 120 hrs. below water in *Maka Ala*. And all of that is

something no one else has done before. I'm also enjoying my literature review too. It makes me probe into a lot of people's ideas and think how they apply to this work. Fine.

August 16, 1980

Kealakeakua Bay, Hawaii

Nice day today, breezy around noon, but calming in the afternoon, though big squalls trail veils of rain down to the southwest. Randy, Shannon, and Rachel went up in the plane today, to fly over schools along the Kona coast until dusk, hoping that they will be able to see aggregation and travel to sea.

My task for the day was to take the Zodiac out to follow schools as they woke. It looked rough and Phylly thought better about sea so Paula, Chris, and I headed for the Zodiac at about noon, wondering if we would be blown back. We weren't. It calmed. The plane told us there were 15 porps in Kealakeakua, but we never saw a fin, even with three observers and binocs. The plane also mentioned a group of five just south of Honaunau, so off we went for that group. We arrived about 1330 and found six animals, including a small baby and one about a third larger and four adults. They were in the bay south of Honaunau, right in against the lava bluff. They circled in that area until we had to leave at 1600. I'd promised Phylly I'd either reach her by radio or come in at four. So, come in it was.

We spent our time timing the dives and surfacing in this little school. It was amazingly regular—dives were between 3:30 and 4:10 long, and surfacings were a bit more than 20 seconds, or usually five blows. The most interesting thing was that a number of times the baby surfaced first by several seconds, especially on long dives. It seemed pretty obvious that a four-minute dive was a bit more than the baby could do, and probably was limiting the diving of the adults. This baby was small enough to throw its snout as it swam.

Once the school lept in a rank unison. Beautiful arcing leap it was, too, directly after a thrash in the water. I don't know if they crossed a shark, or what, but they quickly settled down.

The trip back was slow, with the little 15-hp kicker for power and us afraid to run it flat out because of water supply problems at that speed. Its shaft is short.

Tomorrow I want to go out on *Nai'a*, which is now back at anchor, after Randy had its engines checked, seals and the like. I want to go out to the feeding grounds, and see if we can watch underwater.

Well, off to forage for something to stay myself till dinner.

I had an insight today while reading. Why, I wondered, do males often harass mothers and babies. Often they bite and scratch both, especially the mothers. They will try to mate and bite and prod the genital area of both. Both are unreceptive and frightened and death can issue.

I wonder if in an oestrus animal if sexual advances and reception of this sort are accepted in season and if in other parts of the year, especially for mother-calf pairs they become aggressions focusing on a very sensitive portion of the body. In other words, isn't it still possible that the males are driving mother and young, in nature to a safe part of the school and in captivity without a place to go this will cause injury and death at times.

In the school ringed by adults in times of stress, this places a ring of aggressors around and under mother-calf and secures[?] position. How does Male know when to stop driving them in nature?

August 17-18, 1980

Kealakeakua Bay, Hawaii

Yesterday we took a long trip up to Keahole Pt. in the *Nai'a*, finding a school just north of the point at about 4 PM. It skirted the shore, close in, nearly to Homokohan anchorage and then readed[?] sharply out to sea. In 100 fathoms or so it dove, subsynchronously, spread over a fair stretch of sea, and was not seen again, even though we waited until dusk. The impression of the animals heading toward the setting sun was unmistakable.

I took a reporter, Ron Kruise, from the West Hawaii News, out on *Maka Ala* with Chris. We [?] in perhaps 30 animals, much of the time in the cul-de-sac and he got super shots. Thirty seconds in the pit were all he could take. But we did him good service, and I liked him.

In the afternoon Rachel, Paula, Randy, and I followed the school out to sea on the *Nai'a*. We were on the school at 3:00 PM and by about 5 they headed resolutely out to Captain Cook Point. Once outside, there was a sharp turn, the animals porpoised, in beautiful clear ranks of smoothly leaping animals, back into the bay. They arched over past the anchorage to Palemano Pt., milled, went very close, within a half dozen yards of the lava bluffs and milled back and forth between Maniai and nearby Palemano for hours, with bursts of activity and periods of quiescence. At after 7, as dusk was falling, they headed out, cutting away from shore directly toward the largest light patch in the sky. Leaping increased dramatically, until we lost them in 75 fathoms of water and turned back in the mist.

It occurs to me that the way a school led by an age-related hierarchy but no one leader, decides, is by a shifting equilibrium. Zig-zag swimming is a perfect case in point. One can see the group will oscillate. These group animals decide everything by oscillation of one pattern and the next. Bouts shift that way, and the decision of when to go to school is made that way too.

September 1, 1980

Kealakeakua Bay, Hawaii

I have written for a while, being busy with the book, various bits of field work, and summary papers of a conceptual sort that follow.

Phylly and I went north, met Paul and Mary Lew Breese near Hawi, on the Kohala coast, where Mary Lew has a little woodworking shop—she makes hair prangers, combs, mirrors using native Hawaiian woods. We stayed there for a long and sodden evening (Paul and to some extent me, anyway) when I listened to the incredible complications of Paul's now bachelor life and tried to enjoy the relative simplicity of Mary Lew's work.

Next morning we headed for Kamuela, picked up Roger Coryell at Hawaii Bound and took off through the gap road. We stopped at the Nene-rearing project at Pohakuloa, found Ah Fat Lee there feeding his birds—some Laysan teal, two Mariannas ducks (2 of

only 20 in the world), and a pair of Hawaiian crows (of about 50 alive). These are lovely birds, with rather soft, gray, tufted heads and curious crow dispositions. They've had some reproduction, but not ultimate success yet in reintroduction. Ah Fat's wife is Paul's favorite sounding post, and I don't what it bodes for that relationship.

We went on down to the Mauna Kea road and up to about 9,000 ft. to a cinder cone Roger knew about where one could find olivine crystals inside volcanic bombs. We had a grand, panting climb and found lots of the bombs. The crystal masses are sharply demarcated and usually triangular in outline, corresponding to the outer shell of amorphous material that much congeal first. Then we slipped down toward Hilo, named the venture "Cockamamie tours," holed up in the Hilo Hotel, a grand businessman's hotel for about 2/3 price. Nice place and all we needed. Then we relived Roger's past out on the point near Hilo Bay where he used to go wading in ponds. We did too, ending up waist deep, laughing and catcalling at our tour director. Then we hit Akaka Falls, for the lovely walk, the plants, and the pretty 700-ft. falls.

Back to the hotel for a nice Japanese dinner. Next morning we were off to the south where Roger regaled us with tales of his proposal to Earnie, their churchmouse early life and then his reporterage of the volcanic eruptions down at Puna.

Wild rides in the middle of the night with loaded newsmen running out of booze, Roger finding a bottle, put out for Pele, in the dark in a tree hole—instant hero. Then his mother in law who thought Pele had drunk it told the story for years, Roger too meek to tell her, but he finally did, to gales of laughter.

On to the volcanic park, to steaming vents (big joke)

September 2, 1980

Kealakeakua Bay, Hawaii

This afternoon, John Hickey, Rachel, and I took off on the *Nai'a* to follow a school to sea. We worked our way north all the way to Honokahou Harbor, where a good group was coming down the coast toward Kailua Kona, and we turned and followed it till dusk at about 6:30 PM. It did the following—it speeded up to 1400 RPM on our engines (a pretty good clip, I'd guess five knots or more, then slowed, repeatedly). At the same time it changed course, going out, coming in, mostly following a bottom contour, I thought, about ¾ mile offshore, some course changes were reversals. At changes, aerial behavior would pick up, and as the animals speeded they were often dotted with leaping animals, many headslappings in lunges in the direction of movement. Then, offshore a little, they began some tentative and very short dives, often leaving a few animals on the surface. Then they spread over at least a mile of sea, along the general line of travel. We left them in order to make it back to K Bay before utter darkness (we didn't make that). The total impression was of great fluctuations in speed and aerial activity, starts and near stops, with some milling, fitful tentative dives, as if getting ready for the real thing. In fact, the whole pattern was a long, 2½ hour zig-zag swim, as the animals worked toward the feeding grounds. We never did see a full-blown synchronous dive.

The first time I'd done it, coming into the dark bay following lights, full of pleasure when Cook Point light came up flashing and we skirted to the south, shone the big spotlight on the boats and buoys and finally made our way to the proper one, fished it up after only three tries, unraveled the incredible snarl of line provided on it, shut off switches and stuff, and made our way ashore. I can't think of anything I forgot.

Summer 1980

Decision Making in a Spinner Porpoise School

No single discernible leader of events seems to exist in a spinner porpoise school. Instead, age seems to impart tasks to porpoises that may be carried out at many places in a school by many animals simultaneously. That is, both adult males and females may herd young, or mothers and young in times of stress. And both probably are involved in the changes of direction that take place in a school. From captive observations much and perhaps all turning seems initiated from behind (probably anywhere in the school, and often perhaps from the periphery of a school). If a school contains a mixture of ages throughout its breadth, then nuclei within the school, of older, experienced animals may probably also initiate changes in direction, and probably also of activity, though such activity change may not require leadership, only group response to environmental change.

We note that in paired behavior patterns there is a clear oscillation during the course of such a pattern. Onset may have certain precursors, and then may become rather intense and exclusive of outside influences, except those of the strongest sort. Then the pattern may wane, the partners separate further and further, outside influence may intervene more and more until the pattern ceases. But in the cessation one can see an oscillation back and forth between the pattern in which the animals share, and its absence.

Animals who have been caressing, and who have drifted out of pectoral touching distance, may come together again, briefly, drift apart again and come in for another even more brief touch, before separating again, perhaps finally. An oscillation is involved in which one pattern shifts to another. Onsets are sharper than terminations.

We see the same kind of oscillation on the group level in the pattern zig-zag swimming. The race out to sea ends in a turning back to rest, and to the rest location, and the oscillation can be marked by the fluctuations of aerial behavior. Finally, probably in concert with physical factors such as light levels, scotopic changes, etc., the school as a whole moves, with great vigor and high levels of aerial behavior to sea.

Thus each animal in the school is engaged in shifting modes of behavior whose changes exhibit oscillations that clearly indicate the dual nature of motivation in the animals involved.

This is unlike a fish school. How? It seems clearly mediated by activity level. It seems as if the oscillation observed leads to unanimity and that high activity is also a marker of concerted action by the school. Once each animal is brought to a level of alertness and is in concert with the pattern being reached, it can occur. Previous to that, oscillation occurs. Each behavioral shift requires a pep rally.

(The effect of disruption of rest groups is instructive. What happens is that the activity level rises and shunting from this pattern to the next occurs. "Animals are driven from the bay" may be the same thing as saying rest cannot exist with active participants who[se?] use of sensory modalities are incorrect. A pep rally has been imposed from outside.)

The fish school seems to be the primordial sensory integration system. That is, members are receptors of environmental information whose intensity affects their behavior directly. The waves of influence of Radakov may sweep across a school, causing it to turn, or compress. Nonetheless there is also, in the fish school, influence

between animals that must be modified by such waves of external influence. These are the countervailing forces involved in spacing and positioning of fish in a school. These, for example, are the responses to marker spots on the sides of fish, which when an animal turns, swing across the visual field of an adjacent fish and are picked up, perhaps by edge receptors, causing an adjustment in the receiving fish, to bring stability between marker and fish again. These are the forces that regulate interanimal distance; perhaps the reception of flow fields in the head and lateral line canal systems of schooling fish.

Are there the beginnings of volition in these schools? I don't know, but would not be surprised to find them in view of the fact that learning is a considerable component in the behavior of many fish.

But, volition isn't very evident in polarized fish school affairs. Mostly one seems to see structural internal relationships mediated by sensory relations between the school members, modified by environmental information from outside the school. All this occurs in a dynamic equilibrium.

In the porpoise school, one seems to see almost the exact reverse. Internal patterns seem muted and flexible, at least until stimuli from outside become very strong. One sees intraschool events, and school decisions mediated by alertness states, and features of the diurnal cycle, light levels, sleep patterns, and the needs of social communication (caressing bouts), rather than preponderantly by stimuli from without.

But, in two conditions this is reversed as porpoise schools seem to revert to a degree at least, to the status of the fish school. The first is during rest, in which the quiescent school tightens, becomes more clearly polarized, individuality is muted, movements become much less individualistic. The correlates are seemingly a complex of the dropping out of the acoustic mode of surveillance of the environment (echolocation effectively ceases), and a strong lowering of activity level.

Concurrently, the school becomes much more wary of outside intruders. It is harder to approach and enter a resting school than an alert one. This I lay at the door of the oppression of individuality, and partial reversion to sensory integration. The second is during threats of one sort or another to the school members. In the tuna net we saw the tea cup formation, and a rafting center core of animals. When the school is frightened it tightens and its activity increases. Usually a frightened school flees in waves of simultaneous arcing leaps. A rifle shot behind a school will create this, or release from a tuna seine will do likewise.

The individuality of the alert porpoise school is the gift of the large and complex brain and the consequent intelligence. The function of the sensory integration system of the fish school must be assumed by some members of the porpoise school, probably the echolocation guild, and as a substitute for the waves of information of Radakov, it seems likely the porpoise has substituted acoustic assessments of the status of school safety, from these guild members. Much of the time there is no need for the fish school in a porpoise's life, and there is only a skeletal structure of it left, but the signaling allows it to be resurrected in moments if it is needed.

One has the picture of a very intelligent zebra herd wending its way across the veldt (the sea) with a retinue of predators (in this case less capable mentally) at some distance beyond the escape distance of the porpoise school, waiting for that signal, that opportunity that allows successful attack. It comes, too, as we can tell by scarred animals and the many reports of porpoise remains in shark stomachs. The ancient still wins over

the refined new animal enough to matter greatly; enough to modify the entire course of evolution of the porpoise, enough to retain in times of stress the old, tested methods of tight synchronous swimming, almost instantaneous information transfer, probably confusion effects produced by numbers of animals sweeping across the sensory field of a predator, even by sensory illusions. In fact, the evolutionary battleground between porpoise and shark may lie, ultimately in a battle of illusion; the school deluding the shark, and its sensory system refining to reduce the delusion. I suspect that's where this battle is with all groups and their predators. (Shark threat behavior mimicked)

But, most of the time, the porpoise school can spend its time in the multet of relationships between individuals—the greetings between schools in the morning, the reaffirmation of relationships in caressing, mating, birth routines, the growth, play, maturation, and role assumption of the young.

Yet, not all odontocete schools seem to behave this way. It seems that a basic schism exists, a basic tipping of the evolutionary-ecologic balance that sent some taxa down one line, and others down another. One route, that taken by the spinner porpoise, is to make use of the very great resource of small prey (that, in this case, form the deep scattering layer—the halo of small squids, shrimps, fish, siphonophores, octopi, and larvae), much smaller than themselves, which do not require strength to kill and subdue.

The other route uses larger prey, larger fish, larger squids (some even 50 ft. long), or even other marine mammals.

The one route, the spinner's route, leads to dependence upon the integrity of the school, and its sensory integration system, and with it the decision-making system that relies upon members who are true schoolers—decisions are made by the group, by the oscillation of roles and tasks in times of little stress, and by sensory integration in stressful periods.

Whether the spinner has defense other than the school isn't clear to me. I wonder if the aggressive sound of the adult porpoise can be a weapon.

The other route is that of the large toothed animal capable of its own direct defense. In its polygynous schools defense may fall upon leaders, which mostly falls on the males because of the great disparity of size that polygyny often brings (though note that in nursery herds of sperm whales the females are quite capable of their own defense).

Leadership in the truest sense seems to exist in such herds, and this I suspect, is why their members often strand alive around such a leadership structure that for one reason or other has come to grief.

But, note that even in polygynous schools there is tightening of the school under threat. I've seen it in pursued killer whale schools, and it occurs in sperms. The ontogenetic groups in these schools still require protection—the young, the suckling mothers.

So, I think no open water animal at sea escapes the need for the school in the sense in which fish use it, but that the high order of intelligence of porpoises, and the larger toothed whales has profoundly modified it much of the time.

What might be the consequences of geometry in porpoise schools?

We assume that the geometry of porpoise schools is less rigid than that of fish, and we assume that this is due, in part at least, to the higher evolutionary level the porpoises represent. Part of any such difference, however, might come from the sensory modalities

that fish and porpoise use to regulate their relations to their fellows. What follows is an attempt to reason out, from what we know of porpoises and fish, what to expect from these relationships. First, let us look at the senses each critter is thought to use.

Fish have good vision, and color vision at that. They apparently have the attributes of vertebrate vision; the diversity of receptor kinds in the retina, an eye capable of accommodation (at least some seem to). Their lens is spherical, and some can move it back and forth. Like the porpoise the cornea may be covered with an irregular surface—in the fish an adipose eyelid, in the porpoise a flowing mucal secretion. Both are close to the index of refraction of sea water, and in both we assume the cornea is unimportant for this reason. Porpoises see well but not in color.

Fish have the *ferntastsinn*, the distance touch receptor system of the lateral line and head canals (*campullae* of Lorenzini), sensitive to sounds as low-frequency as swimming motions.

No one knows how a porpoise senses pressure fields around its body, though from watching them assume places at a ship's bow, and other observations, they seem exquisitely hydrodynamically aware. It is probably tactile.

Fish hear, but only low sounds to perhaps 2,000 Hz, and even then there are questions about directional sensitivity. Obviously fishes have this capability to some degree, but how precise it might be, and how intense sounds must be to be heard is another matter. Only some fish have Weberian ossicles, the body chain that extends from skull to swim bladder. Many schooling fish such as the half beaks schooling in front of the house, do not. The question is, even with a single chain of bones and a median swim bladder, how are directional sounds discriminated.

Porpoises are exquisitely acoustic. Most genera hear at least to 50 kHz, and some to 150 kHz. Sensitivity is great. Better than man, and they have biosonar, which may be extremely sophisticated. They certainly can search the environment 1500 m ahead of their schools. Their sounds are highly directional, as is their hearing, both directed predominantly forward. Their sound pickup is likewise directional ahead. There is no question that they can detect predators and food by echoes, and they can hear other social signals. They have refined directional hearing.

Porpoises have no sense of smell; fish can smell down to nearly the molecular level. Both have a sense of taste. Fishes may sense electrical fields; porpoises probably do not.

It is perhaps very refined in both cases. Of these senses sound and light reception are probably predominant, though the electrical sense of fish may be important in transmission of the waves of Radakov. And the sensation of turbulence, of differential water flow, is probably crucial to both. Both probably regulate geometry to some extent in relation to flow fields. After all, a 70% saving in energy expenditure may accrue to the animal capable of playing the hydrodynamic game. In either case, fish or porpoise, they swim all their lives and such a saving is not a trivial aspect of their energy budget.

So school geometry should reflect both sensory and hydrodynamic concerns, and sensory concerns involve both sending and receiving signals.

From the standpoint of each sense involved, what school geometries would be expected.

The predator avoidance strategies used by the animals involved should be reflected in school structure.

Let us look first at vision: In the sea, for a small fish, it loses definition a significant part of the time within a few cm. One fish could not make out the pattern components of another very far away, assuming that these are used in ordering of the school and in regulating differential movement. And in the dark it won't work at all. The cut-off point, at the latest, should be the photopic-scotopic interval—the time when eyes that are predominantly using cone vision switch to rod vision. Rods have much less definitional capability than cones (each serves several neurons, unlike cones). This will hold for both porpoise and fish.

For these reasons I'd expect school structure related to vision to be a daytime thing. If a porpoise wants to assume the visual mode it better be done in the day in reasonably clear water. Is that why our porpoises rest during midday and why they leave when the bay becomes especially murky during or after a storm?

The visual mode for a small fish might require fairly close packing; for porpoises less so. There should be a direct relation between body size and packing in a visual school, and between packing and the size of pattern components used in visual orientation. The 5 mm-diameter black spots on a sardine would be functionless on a porpoise which would, instead, use pattern marks of similar relative size, or several cm in one dimension.

Pattern components related to disposition of schoolmates for porpoises should be

- 1) Beak tips
- 2) Eye patches
- 3) Stripes
- 4) Dorsal and pectoral fins (you can learn a lot by looking at your neighbor's control surfaces. Especially pectoral fins are important. Is that why many are dark and armpits are white—so that tiny rotational movements become obvious? Is that why the inner margin of flipper has a right angle bend over a light field [drawing]?)
- 5) Longitudinal pattern gradations arranged in steps, from dark to light, which allow precise rotational information to be transferred. If, for example, one looks diagonally down, can only the dark cape be seen? Then the partner is in normal orientation. If the mid-lateral gray panel shows, the animal is rotated toward you at 10-20 degrees. If the belly white shows the rotation exceeds 20 degrees.

Note that bottlenose, living in murky water, grade only from gray to white and that belly flashes of white tell even us when a porpoise is engaged in courtship or mating, and the information comes in from approximately the limits of vision.

- 6) Dorsal fins are usually dark triangles, good for close-up assessments of horizontal turn angle. As the fin turns it changes to a vertical dark line.

The visual field of each animal needs consideration. The fields of most schooling fish are predominantly lateral and eyes tend to be rigidly fixed in schooling fish?

The eyes of porpoises are highly mobile, and are on the widest point of the head and furthermore, because behind them lies a pad of cavernous tissue, they can be pressed outward even further. Some porpoises, at least, can look binocularly backward over their

tails. All can look forward binocularly over their own snouts and both up and down binocularly.

The binocular field may be relatively narrow. If vision was mediating school deployment, I could expect partners to stagger in three dimensions.

Key features could be:

- 1) Pectoral viewing. Note that the *viewer* would thus be a *receiver* of attitudinal information and thus secondary (if not even subordinate) in any turns. Of course, in an echelon, a viewer is also viewed by the next animal in the staggered formation.
- 2) Viewing of longitudinal pattern divisions, i.e., dark cape, lateral field, belly white for roll information. Note that viewing down at midbody or head provides the same data.
- 3) Only equals look each other in the eye. (Izzatso?) Thus mostly I'd expect porpoises to avoid utter equality in fore-an-aft position unless ranking made no difference in their schools (one seldom sees them eye to eye). I think ranking probably does make a difference.
- 4) Viewing out by individual animals. As large a field, both fore and aft, above and below, should be available as possible.
- 5) Since the animals are moving forward all of the time the section immediately in an arc in front, at the limits of vision carries the highest degree of unknown. It is there that predators might most often be first sighted.

Predators coming in from behind can be countered by repeated and frequent reversals of course, so that vision sweeps in effect, a safe area, on a repeated basis.

If the water column is kept shallow and the bottom without ambiguity where a dark predator could hide (i.e. sand), security is greatly increased. Note that viewing down against a dark bottom allows a predator to hide even high in the water column.

- 6) By the way, rest in porpoises might be importantly a time for the biosonar apparatus to rest. Recognize that each click contains energy not far from the threshold of tissue damage and only because it is brief is the reason the animal not hurt. Restitution on a daily basis may be needed.
- 7) School speed is important. In the visual school slow speed allows careful assessment of new features coming out of the murk ahead, and at the same time it allows predators to move in from behind. Thus, shifts in direction are especially important. It is likely that a safe area will be "swept" during rest, i.e. covered in all directions. The threshold of danger might be expe-- . . . School ordering for maximum defense should take a finite amount of time t . But this time should vary according to how spread and heterogeneous the school is; when in closed rest-formation it should be faster to reach defense posture than in a dispersed traveling school. This might be expressed by r , which equals the degree of defense posture in %. The sensory modalities used have different characteristics. Vision is highly dependent upon water

- clarity which is variable. In the rest area it seldom reaches 100 ft. and usually is half that.
- 8) In the faster-moving schools danger often approaches from the rear and should lessen as speed increases. But such danger should continue to exist, unless scanning (echolocating) animals also scan astern.
 - 9) The total school should be in visual contact, at least on an animal-to-animal basis. More secure by far is viewing of the whole school by all or most members. The Radakov wave of response to a threat signal should be speeded if animals can see several of their members and sense from a distance a coming wave before it arrives adjacent to them. Forewarning of this sort enhances individual safety. Uniform surfacing will keep the school together and allow them to deploy as they dive, to the limits of vision.
 - 10) In rest most threat is likely to come from below. The visual scanning of the entire water column The best sensory protection would seem to come from a tiered school, with some (the carpet) patrolling the bottom and with others above, watching at various angles and levels.

Now let us turn to own produced sound and echoes as the main sensory modality. Note that this is not available to the fish. Their schools become random at night, members spread, as if when a predator found one member it could not easily find others. How does the night-time school stay together? Do they, for example, emit sounds that no one has, as yet, listened to? . . . ranges than are usually allowed by vision.

Perhaps the acoustic school can be spread because its members have not reached the Distance of School Closure?

What do I mean? The distance of school closure is either the distance between porpoise and predator where active threat is deemed to exist, or the distance to sensory uncertainty within which threat might exist. Either failure of sight, for example, due to darkness of sensory incapability (murky water) or the actual location of a predator, could set off the reaction.

What good is school closure? Do the waves of Radakov speed up with closure? In other words does intraschool communication become faster, more precise, or of better discrimination the closer the animals are to one another? Can slighter movements be perceived? Can, for example, a turn of 10 degrees be discriminated at 2 m than requires 20 degrees at 4 m? If the relationship of distance is not linear it may speed the waves to close ranks.

[Graph]

What I am trying to evolve is a formula defining the point at which, in the absence of predation, a school should assume the defense posture. The same formula should define the point at which the school reacts to a predator closing upon it, by a change in structure.

Terms: t =time required to order school (including reaction time); s =Closure rate upon predator; m =minimum allowable predator distance. This will vary with speed of closure. Effect of multiple predators should be to increase m . Then one should be able to plug in figures for the visual situation and the acoustic situation.

What do we do about predators fore and predators aft? Closure rate from behind should be less (predator speed minus porpoise speed) than turn in front. A vector should be used to account for closures from sides in same term.

Back to sound as a mediating agent—as the sensory modality. Its range is much greater than vision, perhaps 1800 m. With excellent discrimination capability—not as good as close up vision, but better than vision near its limits. It is independent of time of day. An animal in the water column cannot hide (or is it possible to hide under temperature stratification. It is highly directional, both in sending and reception, however, moreso than is likely for vision. Can we put figures on these things? [Drawing]

My impression is that in acoustically mediated school all sounds cease as they move by: clicks, whistles, and burst pulses. If some clicking continued it might indicate the presence of a cadre of animals periodically echolocating behind as the school as a whole passed by. It would be especially suspicious if all one heard was clicks. Clicks are known to be highly directional (the evidence is less clear for burst pulses and whistles) so it will clearly indicate some animals facing away from the trend of the main school.

It may be that because of the velocity of the moving animals and the great range of echolocation clicks such a rear guard is not needed once the school is underway and has traveled some distance. The assumption is that no predator could or would swim fast enough to close on the school from the rear because it would previously have been detected from the front. Within a very wide column.

Nonetheless, chances for a predator to rise from below and behind exist, especially over moderate depths and rough bottom where a predator might hide and slip in undetected while the schools attention was ahead. Periodic reversals of course would sweep an area and it make it safer with each pass.

All this assumes that the porpoises swim in shark-free seas in their immediate area. Like zebras on the veldt this is probably not true. More likely a game of cat and mouse goes on continually, a game of flight reactions and escape distances with both predator and prey present much of the time, swimming as a group.

Within the restraints of certain rules normal behavior by the porpoise school goes on in the presence of sharks. Philippe Cousteau reports such shark-porpoise assemblages every time he dove into feeding aggregations. This seems normal on the yellowfin tuna grounds, too.

The most vulnerable place or situations would seem to be

- a) wandering young who forget the rules
- b) sick animals
- c) when attention is riveted on a catch of fish or squid near or at the surface (a dimension of maneuvering or escape is removed by the proximity of the surface)

It seems unlikely to me that sharks will engage in cooperative hunting, as for example, some predatory jack schools do. I think we can deal with them as individuals, a much simpler problem for the prey species. Nonetheless, having multiple predators is a disadvantage in that it reduced the available flexibility of response of prey. As a school you should not avoid one predator by flowing toward another.

It is more efficient energetically for a predator to swim with a prey group, just out of the flight distance and wait for the misstep than to pursue a prey animal relentlessly at high speed.

This is a function of the power curves related to locomotion velocity and the odds of success.

What defenses does a porpoise have?

- i) Flight, certainly; rapid porpoise locomotion by tight schools does two major things
 - a) it provides much in-air time when drag is greatly reduced
 - b) it reduces in-water drag by formation swimming where close proximity is required for maximum effect
 - c) maneuverability
- ii) Confusion effects. A tightly maneuvering, fast school takes advantage of confusion effects. It may be that this is a function of the differential receptors of the eye (edge receptors, bug detectors, light-shadow receptors) that require “attention” to be focused on their individual effects and only work optimally when there is a one-on-one situation.
- iii) Possible overt defense. Can a porpoise “zap” a shark with high energy clicks sufficiently intense to cause disorientation in head canals (including ampullae of Lorenzini) and lateral line? Is the tail a useful weapon? For a spinner, teeth seem of little use. Does the field of predators shape the porpoise school or does the porpoise school herd the predators (sound?)?

Probably, a porpoise school going to sea accumulates a retinue of sharks, through the offshore time at night, and shucks it off as the school comes ashore and fragments. Probably, at first as a school begins to travel offshore, there is a time without sharks. Maybe we have two stages of predator relations.

- 1) When none are detected;
- 2) When they have accumulated and begin to travel with the school. There could be degrees of freedom of school response involved. Young porpoises, for example, might be allowed more wandering room within the school when “no predator blips were on the radar screen,” than when they were traveling with a feeding school with sharks in attendance. Are schools coming in the morning different in disposition of individuals than those leaving at night? When and where does the school encounter and leave sharks?

Observable Stages of School Structure

- 1) *Tight unified school.* In fright situations very tightly bunched ranks of animals numbering in the dozens of individuals have been seen leaping in near unison (does echelon swimming persist?—I suspect so). The only leap or animal behavior seen is the arcing leap. Locomotion is very rapid, at a near top speed. Such unified arcing leaps also typify the period when clear decision has been made by the school to go to sea, though in such schools other aerial behavior is also seen—spins, head-slaps, tail over heads! Thus we may be able to discriminate fear and excitement without fear.
- 2) *Rest schools.* Tight, slow-moving, daytime schools, diving in unison and spending ca. 5 min. below the surface. Largely but not wholly silent. Only seen in shallow water and usually over sandy areas; polarized.

- 3) *Feeding schools*. Widely dispersed, polarized schools. Sub-synchronous dives, ca. 4 m. Divided in subgroups. Deep water _____ to _____. Noisy, with all classes of sound present.
- 4) *Zig-zag schools*. Schools in transition from rest to travel to feeding grounds. They oscillate in activity. It may take a long time, and one wonders if the shaking off of hemispherical sleep might be involved. At any rate the oscillation between the active state of going to sea and the deep rest is clear. A plot of aerial behavior shows strong peaks and valleys.
- 5) *Going to sea*. A very active race with much aerial behavior, especially the head and backslaps directed along the course of travel.
- 6) *Coming ashore*. In one radio tag track this was observed to begin as a back-and-forth excursion along the shore coming ever inward. It finally ends in a rapid swim into a bay, or a landfall and a working alongshore to a preferred rest spot. There is activity and some aerial behavior.

What does information transfer include?

- a) Does the sound include descriptions of situations, the predator, etc. Analogic signals? . . .

June 1982	White Mountains
July 18-30, 1982	Australia, Queensland
April 5-9, 1983	Granite Mountains
June 2-6, 1983	Mono Lake, White Mountains
September 1-9, 1983	Tahiti, Moorea, Bora Bora

June 1982, White Mountains

Thoughts at Grandview Camp, White Mountains, at the end of the 1982 Natural History Field Quarter

In a few moments we board our blue time capsule and head home. There her doors will open us back into plans, hopes, and uncertainties that typify our various lives.

We have together been part of a rare odyssey of exploration that has all but closed out that other world.

The great patient beast has contained us all this spring and at its wonderful pace taken us the length and breadth of our magnificent diverse state. In the process we have been transformed from a shy, expectant group to one of growing camaraderie. We have all come into focus like slides at a show. We have found much diversity in each other. At the same time we have felt, rather than stated, the strands that have come to tie us tightly together. I will return to these things in a moment.

Another thing has happened. We have evolved in trust toward one another, finding that essential dignity of belief can remain intact in spite of our diversity. We have found that such dignity has nothing at all to do with clothes, or their absence, or layers of dirt, or language, and everything to do with respect. Each of us, I find, has much that is worthy of respect. We are no longer cardboard cutouts to each other.

We can even know and love Andrea, even when she paces in back of us like a caged panther, prattling on and on interminably about the moon, while the cold night creeps deeper into our bodies. And when she is shown to be wreathed in a chlorophyll-impregnated afro we even have the strength to laugh.

It hasn't fractured anything important because Sarah inverted her day-glow buns to the world, shining like twin red searchlights at a Pizza Parlor opening. We even cheered her as one as she floated toward the Matolle River mouth.

But the strands that tie us are made of other things too. They come, I think, from the essential human quest for underpinnings to personal philosophy. We all feel intuitively, I believe, that such sources must come powerfully from nature.

I perceive that one such strand is aesthetic, and needs no latin names or equations. I've wondered about it for a long time now. Why should we feel such peace and such a sense of attachment out here in nature? Why should we think of devoting our lives to her protection?

That perfect cream-colored cup of *Lewisia* that we found up at Sierra View, has, we intuit, much to tell us. There is a *rightness* about it, as it thrusts up through the *Eriogonum* cushion, and sequesters its fleshy root close under a warm slate slab. To dig it up, as I did, was to defile that rightness.

Later I think I did it again, as Gary gently and wordlessly led me away from cutting dead limbs off pinons for our fire. He took me to a downed log whose severing

did not leave the live pinons bereft of their long scaly dead limbs, which are so filled with “rightness.” I don’t know what was on Gary’s mind, but it doesn’t matter since the conflict was my own anyway.

On the hike up the Methuselah Trail I fell to thinking about this “rightness” and what it might mean. I concluded that it is the shape of our connection to the natural world, and that it is the essence of our aesthetic understanding. It is a manifestation of our experience with nature and it involves form, pattern, color, energy in all its forms, and even a broader conception of how the world must work even though we cannot see more than a bit at a time.

That wild clashing of wind, river, stinging sheets of windblown sand, tides, and waves raised by distant storms far away from the Matolle River mouth was perfect in its “rightness.” It drew me to it until I could stand no more.

Yet, to many of you the Matolle and its enclosing hills was sick and very much “unright.” It’s splintered trees cast a pall which many of you were never able to shake away.

Our common sense that nature’s patterns are “right” reach deep into most, and maybe all of us. They are our windows to the world against which we measure the flawless beauty of an etched and fluted bristlecone trunk, the shining sweep of Mono, or the shimmering leaves of an aspen in all its exquisite geometry.

Many of us wonder whether our modern contact with the natural world can ever match that of aboriginal humans who were, after all, of the land. We watch with deep guilt as their torn and fragmented peoples struggle to regain the dignity of that connection. In my view we can, but the pieces and paths are inexorably different, but nonetheless, valid. We know both more and less than they. Our view extends to the cosmos, while the much more restricted “window” of native Americans produced a world view of much less detail. In effect it verifies the statement that “humans, whoever they are, will explain their world whether they can or not.” Our explanation may be merely more intricate than theirs. Boundaries beyond explanation sweep away from both of us.

We can never fit in the Tuolumne as a part of that system as those patient Indians did, who talked and ground acorn meal in the bedrock mortars above our camp. But, we know much beyond too, such as the sources and sinks of their river and its part in global balance.

But, I perceive that our sense of “rightness” comes closer and closer to theirs, however different our windows, or our means toward understanding. In both our worlds this rightness comes to encompass our faith, our dignity as a people and our ethical foundations.

Very much more than most things in our littered society, my wonderful colleagues Steve and Larry are of this rightness and so are all you newly minted friends, my fresh-minded colleagues on this odyssey.

As Richard would say, “I’d hug you all if my T-shirt weren’t so dirty.” (I will anyway.)

With great fondness and respect,
Ken

July 18-30, 1982 Australia, Queensland

July 18-19, 1982

Cairns, Queensland, Australia

George Hernsohn, Phylly, and I drove from Townsville up to Cairns, leaving about 10:30 and arriving 5:15 PM. The drive was a fascinating one through wetter and wetter areas until just before Cairns when we entered again gum tree scrub. By Tully and Babinda the vegetation was true gallery rainforest, some coming down on both sides of the road. At Bartel Frere we turned west through cane fields toward Josephine Falls on the SW slope of Bartel Frere (5,322 ft.) the highest mountain in Queensland. It is a granitic peak entirely clothed in dense rainforest. At a small camp at Josephine Falls we hiked a short trail (1/3 mile?) to the falls, a series of cascades and low falls running from pool to granite pool. A young man rolled rocks looking for freshwater shrimps while his girlfriend looked on disinterestedly.

The forest is magnificent. The understory is a bewildering array of ferns (some like banked bracken), ginger, "celery top" (a dicot tree), ti plants, lawyer vines (a palm—the longest in the world), hoyas, and unidentified vines. The buttressed bases of 150 ft. trees appeared here and there, rising to crow's way up above, most festooned with mosses and especially ferns in huge clumps. Some strangler figs in the vine stage were seen hanging like giant stiff ropes to the ground.

We were warned about leeches but saw none on our nice trail. The day was shining sun and no rain, but I guess it's seldom this way. Babinda, George says is the wettest place in Australia (150-200 in. rain/yr.) and it shows it as trees are festooned with ferns and old roofing soft with moss.

Old style Aussie hotels attract us with their broad upstairs verandahs all around, and grill work. Many were plain, however, looking like they belonged on the frontier as I guess they do. John down the hall, and all.

At Cardwill by Hinchinbroo Channel and Island, where we had lunch by the road, the low tide exposed a broad shallow reef flat simply alive with *Periophtalamus*. We watched them wriggle at each other in territorial disputes. The big ones erect a peculiar flag-like dorsal fin from time to time. Both George and I mistakenly thought it was pectoral until we saw the two eyes in the right place. The burrows are spaced but many are within a foot or so of the nearest other burrow. Many pictures and on to Cairns where we holed up in the Golden Key Motel and Caravan Park (you can rent trailers or rooms). We rented a room with 4 beds and a kitchen and went off to find Ray Oke. He lives just up the hill but we found him at his coral shed downtown where he was working on his 21-ft. inboard (Volvo) boat (fiberglass with a sun shade and cuddy cabin full of a welter of drive gear).

Arrangements made, we had a nice seafood dinner at a "bistro"—an a-la-carte salad bar, pick up a ticket, cheap by Aussie standards.

To bed.

At 5:30 we arose, had a bit of breakfast and made it down to the town launching ramp where after [?] Ray appeared with his partner Peter Escreet of Melbourne. Both are young men in late 20s I'd guess, low-key, outdoorsy, full of good humor and at home on the water.

Once launched Ray suggested we go north of town at Trinity Beach about 12 km N of the harbor at Trinity Cove. The shores are gum tree scrub on granite headlands and long, arcing, sandy beaches. The bottom is a rather shallow sandy flat, averaging perhaps 30-40 ft. deep. The day is clear and calm. The temperature is about 65 degrees F.

Orcaella is reported to swim more like a dugong with very little show of its small dorsal fin, than a porpoise.

Trinity Bay is about ½ a mile of good sandy beach bounded by granite headlands. The south limb has dirtier water than the north. Some galley forest occurs in canyons surrounded by gum scrub. Kawara Beach: Fair amount of offshore breeze has sprung up.

Clifton Beach: A small group of *Sousa chinensis*, water calm, starting to [?] to, low dorsal fins, brownish back and lighter sides. They swim slowly and not much different than a bottlenose. Their low fin is the tip-off. Its margins are sometimes whitened as if by abrasion.

At least four animals—perhaps more. One rather smaller one. Largest is about size of a moderate-sized bottlenose. They seem to be feeding, or chasing fish, in a circular mill. I saw fish. I saw one throw his flukes out and his body sideways so his flukes were “flat” to the direction of movement. the flukes are fairly large and rather often seen. I saw them give “hitching” locomotion like a *Phocoena* with the flukes held below the water. The “hitch” if from a fluke stroke given as the animal rolls at the surface and dives.

As we approached, cut our engine, the sousas very soon began to maneuver offshore and to dive and evade us with underwater traverses, once again reminiscent of *Phocoena*.

We lost them.

We saw them breach twice, with two animals leaping in a crossing pattern directly aside one another going in opposite directions. Just like at the oceanarium (after six months training).

Phylly saw them split into two groups, one of two and the other of four to five, 20 ft. apart.

Ray says the bay water is usually murky and the sousas were right in the middle of the murkiest part.

As we move up to Palm Beach the water clears significantly. Hightide was early this morning, and it is on the receding tide now. Ray says they move offshore at low tide. He says his dad caught *Orcaella* with a round haul net maybe 8 ft. deep payed off a sterntable at 20 knots in a circle around the animals. They worked quickly to get the net into water shallow enough to touch and beached them.

He says offshore captures of spinner (he had a captive for two months) were made with a tail grabber that stitched a loop of rope around the tail stock and fell away. He says the light model was best. His memory was uncertain—he said the orcaellas might have come out of shark nets. Most of the time nothing alive comes out of the shark nets.

North of Double Island: a band of sousas 300-400 yards offshore in murky water.

Phylly tapped hydrophone twice for this [?] of tape, through preamp.

A couple of channels of tape with four taps, no preamp at [?] start.

Sousas 100m off starboard bow, 4-5 animals, back to preamp at 5 taps. Max sensitivity.

Lollygagging, in a mill, one rolls upside down and bends its neck and head back toward water as it dives (seen often). Only dolphin I've seen do this.

Very flexible necks are evident in these animals. They can move their rostrum almost out their chests when in inverted position.

Back drive seen again. In last couple of bands of tape 1 the animals were close by, playing with one another. They are not nearly so spooky as the Clifton Beach school. We could beautifully see long snouts of the animals. Sousas for sure. The melon is rounded and prominent.

A school of sousas playing off N. shore of Double Island, we will make tape No. 2. Two *Tursiops* seen, they travelled right with *Sousa* for a couple of minutes and then moved off in opposite direction. They were as if a part of the *Sousa* school (but occupying a distinct sector). Three sousas, 2 *Tursiops*, 50 m off stern.

Tursiops leave to north as sousas lollygag to S. toward Double Island.

100 m. off port beam facing away, moving slowly, pure *Sousa* school now. Band #2 milling off starboard quarter 150 m here they come, arcing inside our bow. A large animal has whitened margins on its dorsal fin.

Hydrophone is 3 m down. Animals are still moving slowly at surface. Band 3 off Ellis Beach, N. of Double Island, animals very close into boat when hydrophone lowered. Another tape was made on a [?]Recorder and a home-made hydrophone.

We are recording with a LC32 hydrophone, a Lockheed Instrumentation Recorder at 30 ips (1/4 in. tape) plus a small preamp. The record level, even so, is faint and the ???meter seldom budges. I worried that its battery wasn't good, but it proved OK. While we were at this Ray tried to start the boat but it wouldn't kick over. He traced it to a faulty coil and quickly produced a spare which when installed, worked. He's a good guy to be with, calm, with a lilt, and with common sense. We headed back after photographing the last group for a while and worked on gear all afternoon.

July 20, 1982

Cairns, Australia

We're back on board the *Cilla*, same crew and this time we will spend a little time exploring the edges of mangrove swamps and rivers to see if *Orcaella* might not frequent them. North of town mangroves line a giant shallow mudflat only traversable at high tide. We began before the tide had peaked and ran over this flat, only now and then stirring the brown muddy boils of water in our wake. Though the water lapped among the prop stems of the mangroves no animal greeted us.

Still further north we rounded a headland and entered the mouth of the Barron River. It drained a large mountain area behind Cairns. Here it is mangrove banked broad and curving, with occasional gum forest coming to the cut bank.

Flocks of Australian pelicans stood on the flats in one place. We left the river and headed north. South of Yorkey's Knob, about 300 m offshore we encountered a relatively fast-moving school of *Sousa*, a couple leaped out of the water. Our first band, for some reason seemed overloaded. One 1/2-grown young is in the school. Moved into Kawara Beach under clear skies. Nobody home at Trinity Cove we encountered five *Sousa* as the S. breeze began to blow up and make whitecaps not far offshore.

We now tried to move into a group of three farther offshore. These animals did not show the play behavior seen yesterday, only just relatively slow surfacing. They stay

under water from 30 sec-1 min. The water is rather murky—in fact we have never found animals (*Sousa*) in any other circumstance. *Sousa* seems to be a murky water animal, slow, probably always pinging when it is on the move, and nearly always moving very slowly—a knot or two.

Finally, on down the coast about two miles S. of Unity Reef we turned for Cairns into an increasing head wind, and then pounded on our way back amidst great sheets of spray from the bow.

Back near Cairns we took a little detour up the estuary to peer at a Chinese (Taiwan) clam pirate junk that had just been impounded. I know I wouldn't like to head for Taiwan in it.

At about 7 we located an Italian pizza maker and had a beer and a very tasty, hot pizza.

Then Phyl and I went off on a tour of a local sugar mill which was very interesting.

Then to bed. I was pooped.

July 21, 1982

Cairns, Australia

Started off from the harbor and cut S. along the Cape Grafton Peninsula south of Cairns. It is a series of sandy coves and rocky headlands and it is washed with the shallow mudflat from Cairns Estuary until one nears the Yarrabah Aboriginal Community (a reservation for Aborigines). We rounded False Cape and then turned north across the harbor mouth. It was funnelling an offshore breeze out to sea and a vicious little beam swell and short chop soon sent sheets of spray over us. I called a halt to protect the recording ear which we had resting on some rubber diving suits on deck. That done we bucked our way up the coast past the mangroves. Our hope is to arrive at the northern beaches before the tide begins to recede.

The northern bays are not so shallow and at any tide 20-30 ft. of water can be had 100 m. from shore.

Our compliment this morning includes Victor Jacobs, an amateur naturalist and teacher from near Birmingham, England. He is Ray's father-in-law.

Off the N. end of Half Moon Bay two sousas 350 m. offshore, however the animals were largely silent.

At Buchans Beach (Clifton Beach) we took a control band in the same place we saw animals yesterday. The water is very very quiet. Band #3 taken astern of a traveling drag boat where two sousas (an adult and a closely attending calf) swam and dove in the wake. There was much motor noise.

The sea is picking up. We'll have to go into it.

At Cook Hwy Lookout we turned back—in the far distance we could see the plain on which Port Douglas sits and Thornton Peak (4500 ft.) the third highest peak in Queensland. From here its bulk could be an island.

We headed for Nudie Beach (Buchan Point) for our coffee and a biscuit. A welcome relief in the calm bay, its rocks festooned with several kinds of fauna. Off Double Island, Ellis Beach 500 m, we encountered a pair of *Sousa*, calm and clear and some breeze.

It's a mother-young pair. Later we spotted a *Sousa* off the coral reef at Double Island but we could not sight it again.

I should note that we've taped two bicycle tire inner tubes on our hydrophone and it does wonders for the water noise. The hydrophone slides up and down in the swell rather than dragging the hydrophone forcibly up and down

In the afternoon we visited Ray's dad, Victor Oke, who had set up the Cairns Oceanarium from an old swimming pool. His garage was full of things from his museum including a plaster cast of an *Orcaella*. It lived three years and may have died of *Ciguatera* poisoning.

He caught it in a round haul net very near shore. He said the animal was very flexible and might be able to take its flukes in its mouth. It was capable of a powerful bite he said, but it was very affectionate and a pet of all. It would not leap free of the water but learned quickly. It has a big pectoral fin shaped this way [drawing] and very broad flukes. Its dorsal fin, 2/3 aft, is well formed and not so triangular as *Sousa*'s. It's still small for an animal so large (6½-7 ft. I'd guess).

The narrow neck is clearly obvious and Victor said it could and did turn its head sideways to look at you instead of moving its body as other dolphins do.

Victor had never seen them more than about 500 m from shore and had seen them in mangrove channels near Cairns before boat traffic got so great.

I like these Okes a lot. They are direct, honest, capable, and friendly.

After that soiree, we visited the Queensland Fisheries Lab down by the harbor and I psyched out why my volume is so poor on the tape recorder (problems with use of the preamp). I have about 20dB more now. We'll see what tomorrow brings.

We reached the dock at a quarter to 7, with newly found knowledge about our preamplifier. I was able to get about an additional 20 dB out of it.

We headed out the shipping channel from Cairns Harbor—a dredged waterway through the extensive mudflats. Yesterday the big dredge chugged along low in the water, its spoil bins nearly full.

We headed out along False Cape over ever-deepening bottom, cutting close to shore to make a good inspection of every bay and headland.

We skirted across Mission Bay on the way out. This bay has an aboriginal community.

Of perhaps 2000 people set along its back shore (Yarrabah). Normally the bay is closed but we were told that nobody really minded if we traveled through.

We rounded Cape Grafton into a moderate S. breeze. The currents and funnelling of the water in the passage made for a bouncy sprayed passage but beyond it was quieter so we continued on down past a long, sandy beach, turned and headed back, looking hard at the band of water from surf-line to 300-400 m offshore. Not a beast did we see. Then we rounded the Cape (Grafton) and entered Mission Bay from the east. [Map of Mission Bay]

We touched bottom a couple of times on the south limb of the bay, and aside from a few birds—egrets mostly—we saw nothing except possibly a turtle.

On back to Cairns Harbor we went, passing among the anchored, moored boats to the inner mangrove area at the head of the harbor. It is extensive—perhaps four miles of swamps and channels in one dimension. Our track wound around in the curving channel. The tide was up amongst the prop roots and no more than a foot of mudbank remained. It

was honeycombed with crab burrows from which we could occasionally hear loud snaps or clicks. Listening to the mangrove banks one could hear such clicks every few seconds.

At one point we recorded a short band as a control and the waters proved to be terribly noisy with muffled clicks or bangs.

The main channel through the mangrove swamp circles a large island. Into the opposite bank dumps the series of smaller drainage channels. [Map]

The channels were generally quite deep in most places and the banks an impenetrable tangle of prop roots, mud, and fallen trees. One can image what an ordeal it would be to try to traverse such a forest on foot if one's boat failed for some reason.

Up one such channel we tied up to an overhanging branch and had our morning tea and rolls. Then up another channel we passed the fallen-down camp of a man who tried to build a boat out of mangroves to sail overseas to visit his son. He never made it and died some years ago, his boat now rotting in the swamp. George said the mosquitos are fierce in summer in these swamps.

Up another we wound around and finally came to a house and dock to which two large trawlers were tied. We asked if dolphins had been seen and one man said no, but he was only a visiting mechanic and probably knew nothing.

Lyle Squire of the Queensland Fisheries Department had been up one channel last week and had encountered dolphins. Though we searched hard we saw none. But they could have given us the slip by being amongst the prop roots or up the very extensive upper channels where we did not go.

My impression of *Orcaella* is of an animal that habitually frequents restricted water situations. Its very flexible neck and body, its big paddle-like pectorals, its little fin, and its large flukes, and finally its light color all suggest this. It may, in fact, be a mangrove-adapted dolphin. I believe extensive mangrove swamps occur throughout its range. It is reported to eat crabs and have a very strong bite. All in all such a habitat would make sense as an important habitat for our beast, with riverbank situations and the back reef shoreline another.

But all this is speculative and we need to see it.

Ray took us across a mud bar in which we became stuck. We were able to wiggle off but very soon the motor began to heat up and he stopped it to open a filter on his cooling system. It was crammed with mud. It took three iterations before it came clean and the engine could run cool.

Shortly afterward we reach the launching ramp and our trip was over. Goodbyes were said, invitations to visit us in the USA given, and we left for Mission Beach, about halfway to Townsville.

As for *Sousa* it seems also a murky nearshore animal and in several ways a precursor to *Tursiops*. That's one reason it was so intriguing to see them school together. *Tursiops* is much more of a generalist than *Sousa* but it inhabits *Sousa*'s habitat, except the rivers, if one includes *Sotalia* in *Sousa*. The places we found *Sousa* were murky water areas, especially where tidal rips and roil were prominent, and never very far from shore.

Did *Tursiops* arise from something like *Sousa*, and did *Steno* also come off such a stock? Do all three hybridize? Certainly *Tursiops* and *Steno* can.

Where did *Tursiops* arise? It's cosmopolitan in tropical-temperate environments. Might it have arisen along tropical shores from an earlier more restricted estuarine-riverine stock?

As for *Orcaella* it's a creature of the Indopacific heart and a creature of restricted habitats, especially, I suspect, mangrove swamps and their channels. Mightn't it have come from a warm temperate belukha ancestor, perhaps in the western Pacific. Though we only know of fossils from the eastern Pacific, of early belukhas there is no reason to exclude them from the western Pacific. Fossils simply haven't been found. But even in Japan proper a mangrove differentiate could have been developed and then moved into the Indo-Pacific proper.

July 23, 1982

Mission Beach, Queensland, Australia

Our day started out by awakening at 7:00 at a motel at Mission Beach. We had driven down yesterday afternoon to this place very near where we will go to the Barrier Reef. It's a nice but somewhat seedy motel right on the shore of Bingil Bay, just to the north of the little pier. At the pier we paid our fare and were soon on board a cruise boat that packed perhaps 60 people aboard. The voluble skipper welcomed us aboard and soon we were headed directly out to sea in a nearly flat calm. Rain squalls, however, darkened the horizon. Aside from a single *Tursiops* that came to run our bow not long before we reached the reef I saw nothing of much interest on the way out. About 10:45 the tiny little sand cay at the reef came into view as a shining lozenge of brownish silver dividing the sea and sky. It grew larger and we began to see the reef itself, making the water greenish around the little cay. The cay became a mound of bright coral sand with about five rather sickly looking young palms on it—they had been planted.

We sneaked into a little sandy bottom reentrant in the reef and dropped anchor in perhaps 40 ft. of gin-clear water. Immediately schools of fish converged on us. There were three major kinds—a snapper of about three pounds, brownish and faintly striped, a jack of golden yellow color and much smaller, and a single great seven-ft. hulk which proved to be a groper (*Promicrops*, I'd guess) weighing 400 lbs. They had all been tamed by a skipper of the boat and came alongside to receive gifts of bread and fish. The jacks and snappers ate bread with great gusto while the grouper held out for a ration of fish. The skipper said he'd learned by experience how much he could feed the groper before it was sated and wouldn't return on the daily cruises. This time he received about five gar fish (halfbeaks). This halfbeak would run about 3-4 to a pound, I'd guess. This squares well with my memory of gropers eating once every two weeks, but then of a considerable amount per sitting.

George and I decided to go snorkeling, while Phylly and Ann went for the glassbottom boat and a walk on the 100-yard long sand cay.

George and I donned our gear and slipped over the stern into the 70 deg. water. On either side of us, 50 m away, were reefs with the living ledges about ten ft. below the surface. Leaving the powdery white coral bottom, we entered the reef area. Its edge was tiered with dish corals, great shelves spreading out like platters from a rather small central "stalk" that we are told it is easy to break, tumbling the coral down. Green Island we were informed has none of these dishes left because divers have tried to walk on the dishes and broken them off.

Staghorn coral patches were frequent, and often brilliant dark blue with almost iridescent blue tips. If one looked closely it was possible to see the polyps of the living

coral animals dotted densely over the coral arms. The name staghorn is apt because the branching of the coral is very much like that of a staghorn.

Now and then large brain corals rose up, massive and rounded. These are basement animals in reef formation we were told. Soft corals were especially prominent. These often assume the shape of giant anemones, but at once can see that the basic structure does not move, only the surface which is waving with polyps like a shag rug. These came in tones of browns or green usually, some light apple greens and some pale lemon yellows. Sponges were also prominent forms, mostly tans, yellows, and browns.

Now and then I swam over a giant *Tridacna* clam, some a meter long. Their mantles spread out over the prongs of their shells in waves. The mantles were deep bluish with bright iridescent blue spots, and others of emerald green. The two siphons were open and water was being pumped through, allowing one to look deep into the flesh-colored interior of the huge clam—strange stationery molluscs that had apparently lived or a hundred years or more in a single place. The Taiwanese junk we viewed at Cairns was apparently poaching these ancient giants and had a hold full of the meat.

Some of these soft corals were so long and flexible that they had received the name “spaghetti coral” from the locals. Indeed it did look like a patch of brown spaghetti waving in the undersea wind. Now and then, small patches of bright green grasslike algae could be found, long and soft. It was surprising to see how circumscribed these patches were. They only seemed to occupy holes in the reef a few inches across. Perhaps if they are any bigger grazers, which are dominant reef forms, can kill them and only in pockets of small size can this be avoided. But the story shouldn’t stop there because why don’t these same grazers simply eat the waving ends of the grass?

Fish were everywhere. I could take most to family, but the species were all new ones to me, since I’ve had no experience in the giant Indopacific faunal area. Pomacentrids were very common, whole schools of them flashed and flowed in front of my mask.

Wrasses were common too, including parrot fishes of a couple of species at least, Cirrhitids were there too, and in the sand pockets, lizard fish. Most fish were small—less than 10 inches, I’d guess. I saw one classical cleaner fish (*Labroides*)—yellow, black, and violet.

Later, I took a run on the glassbottom boat and found that the skipper was really quite knowledgeable about reef animals. He was able to point out clumps of dark wine-colored “feather stars” which were crinoids. These were especially attached to vertical walls of the reef where it began to drop off into deep water. He showed me a great spreading, pearly white-colored anemone accompanied by 5 or 6 *Amphipriod* fish of a form I’d never seen before—perhaps five inches long, with the diagonal white bar through the eye and a bipartite body color of red and deepest blue on the belly and after back.

We looked at places in the reef where the coral had been killed by crown-of-thorns starfish. The skipper kept this reef clean of them as well as he could. He said that reefs farther north were 80 percent destroyed by the stars and he laid the cause at the feet of those who had cleaned out the helmet shells, which eat crown-of-thorns.

We swam back on board after our snorkeling, and then spent a fairly abortive time fishing before heading back with a quartering swell following us and causing the *Friendship* to roll mightily. Phylly and I had been wearing our Transderm patches and they stood us in good stead here with us only feeling lethargic and sleepy.

Ann who is a very interesting gal, doing the history of the Northern part of western Queensland, whipped up a dinner for us, and then we wandered off to our room and sleep.

July 24, 1982

Townsville, Queensland

Because we were going to visit some friends of the Heinsohn's down a country road, and because Phylly and I were still a bit nervous about driving on these narrow roads on the wrong side, we split up, Ann and Phylly, George and I, and set off. The roads are just wide enough for two cars and when passing in opposite directions at 100 km/hr it's invigorating and the edges of the shoulder are rutted with the wheel tracks of thousands of cars. It's a way of life to drive partly on the shoulder.

And then the bridges are too narrow for modern semis and there are signs for one lane to wait for the other on some of the narrower bridges, and that's exciting too.

Anyway, not far from Cardwell we cut into a dirt road leading toward the sea. It led to a small National Park that included some of the mainland rain and mangrove forest and what seemed to be an indeterminate amount of Hinchinbrook Island offshore. At a sign that said "Private Road" we turned into the forest down a long winding one-lane path. The forest here is a mixture of rainforest elements, gum forest, *Melaleuca* scrub, and occasional patches of marsh. Later we learned that this road is underwater at the time when the rainy season comes in full flush. Rainfall exceeds 80-100 in. a year here we are told.

Finally, we came to a clearing grassed and dotted with trees and walled with forest. Set on one side were some ramshackle buildings, one of which turned out to be the house of the Thorsbournes, Margaret and Arthur. The place was called Galmara and it was on Meunga Creek.

Arthur came out—a leathery stubby little man with tufts of hair whispering up over his freckled pate, no shoes and feet as tough as leather, a handshake with the rough hands of a laborer. Behind this lay a sharp mind and a compassionate one, his compassion directed mostly at embattled nature in northern Queensland. His wife Margaret looked like a proper little British lady (she wasn't I don't believe) (she's an Aussie from, I think, Melbourne) but it was she that would have nothing to do with electric lights, favoring Alladins (kerosene) instead. Her pale hair done up in a bun, dressed in a light frock, her usual comment to any sally was a broad "Yaas." She is an artist of delicacy, making cards that are works of art to be sent to ones that need to be brought into this or that cause. Together they protect this park, along with a local ranger named Sav, to whom I will return.

Their house is all open doors tending into verandahs and the forest. In back they have a screened bedroom wing and bathroom with a giant tub, where they find surcease from the mosquitos in the dry season. Right now only a few fly but it gets thick I gather when the rains come and one's arms get black with them. Arthur says one becomes hardy to them and they no longer sting much.

They've set garbage can lids around the forest near the house and every day Margaret fills them with water for the forest birds to bathe in. And bathe they do. All sorts of entertaining critters come out of the woods to partake. As we entered, three species of honeyeaters flashed down out of the dense forest to splash in the water and

take off. These little birds are miraculous flyers, being able to negotiate the trees and vines that crowd the forest floor with such agility that they can quarrel with one another in flight, tumble and chase all the while avoiding the numerous obstacles just as if they weren't there.

Not long after we settled on the verandah for tea and scones (biscuits and honey), we noticed a rustling in the leaves and two jungle fowl, or scrubfowl, bobbed past, kicking leaves aside just like banty hens. They, we learned, are megapods and build communal leaf nests deep in the forest. These are heaps of leaves that may be three ft. high and as much as 15 ft. across, usually started around a pile of rotting logs. The fowl lay their eggs down in the leaves and then tend the pile, testing it with their beaks for temperature. They are reported to hollow out areas on the surface to catch radiation so the eggs may incubate. Later we saw several of these mounds. In use the hens keep the surrounding forest free of leaves which are scratched onto the pile.

Not long after, a grand brush turkey came sauntering up, a glossy black feathered bird like a small turkey, it sports a narrow, rounded tail flattened laterally, deep with a rounded tip, like the rudder of a boat. The turkey's neck is yellow and its head is brilliant red. We had two about the house, and were told they could become a great nuisance, picking out new plants and walking in the house to take food. It also kept the pitta away. This little hopping forest floor bird was a favorite and would come up on the back porch for a bit of ground meat. The Thorsbournes didn't feed any other birds, but they lost their resolve with this bold gaudy engaging little bird. It is a beautiful creature—crimson, green, emerald-blue rump and wing coverts, brown throat, and head with a red nape. It is supposed to feed on insects and other bits of food it can find on the forest floor and not to fly long distances.

About this time, big, hulking, kindly looking Sav Mostecetti drove in (he too was barefoot), the ranger assigned to the park by the Queensland National Parks and Wildlife Service. He had abandoned a job as owner of a cane plantation to work for the pair. He lives at Bemerside, Ingham.

He and Arthur fell into discussion of the doings of the park—the problems with motor bikes and minor vandalism. My impression is that they don't yet know what vandalism is. Margaret took us on a walk down to the river identifying plants as we went and looking at orchid and fern clusters up in the trees. We ended on the gravel sand and mud bar of a slow moving stream that a mile below led into the sea. It had had crocodiles in it at one time was probably had none now.

Then we went by car to a marsh at the end of their roadway to look at 15 brolga cranes feeding in the wet meadow. These are big cranes, gray with black on their heads that look much like our sandhill cranes. They flapped and danced as we watched. Back at the house we set out on a trip through Sav's new mangrove trail. He and his workers have built a wonderful forest trail that periodically drops into arms of the mangrove swamp and emerges along the shore. It runs for something more than a mile and goes through some of the most lovely forest I have seen. And different from any I have ever seen before too. The largest trees are paperbarks, but amongst them are a species of tree with lovely rusty red flaky bark (*Delinea*) on which orchids clustered. Stagorns made enormous clusters up the melaleucas, sometimes so heavy they fell off in bushel basket-sized chunks on the ground. There were many wattles too, acacias and some blue gums, and ones with green bark above and dark crenulated bark about to eye height. *Hoya* vines

were common as were many other kinds. There was a lovely broadleafed *Bignonia* too. So much, it was impossible to take it all in, or even begin to. The places where the trail reached mangroves were wonderful dark, almost ominous secret places. The trail followed a wooden walk set on cement pilings and one was led through a weird forest of prop-rooted mangroves, pneumatophores rising everywhere, pockmarked mud in between with many burrows occupied by a dark species of crab. The loud snaps were there too, though we never saw the animal responsible. There were more than a dozen species of mangroves too. Finally the trail led behind the beach by a berm amongst clusters of giant spider lilies, and there we saw a remarkable fern, the ribbon fern, epiphytic, and hanging like green wavy algal strips perhaps two ft. long, by the hundreds from a single clump.

We returned, said our goodbyes to this remarkable couple and their funny little house (I forgot to mention the Wren cottage, for visitors, a sort of house on the half shell with two open sides and a bedstead covered with mosquito netting, a dresser and other amenities, pictures on the wall).

Off we went to Townsville at dusk, with the Heinsohns driving the perilous road. A hundred miles later and we were at Townsville where we had a spaghetti dinner, a bottle of good Aussie Moselle and then found Ann's car locked with the key inside. They drove us to our apartment and then went back to get a spare key and deal with the stranded car. A fascinating trip with a lot of good people worked with or met along the way.

I get a feeling of some power in the conservation area from George. He is diffident and quiet, but he likes the local people and knows how to hunker on the porch, and he cares deeply enough to fight the good battle. Everyone likes him, and this takes the form of him being elected the president of the Wildlife Preservations Society of Queensland, and a member of the Australia-wide Conservation Foundation. He mentioned he felt uncomfortable with these titles because he was an American citizen, but he agreed with me it didn't make any difference where he came from, considering the good things for the natural environment he was trying to do.

July 28, 1982

Townsville, North Queensland, Australia

We have traveled down to the Townsville Airport to a flying service in order to take a flight along the coastline and around Magnetic Island, in search of dolphins and dugongs. We will fly at 700 ft. With George Heinsohn and myself is John Robertson, who will also be helping us with the boat, should we find animals. Our first traverse was up toward Magnetic Island, and then we will traverse across to Point Cleveland and down along some of Bowling Green Bay and back. The weather is clear and there is an increasing breeze from the south.

We fly over the town common which is an interesting habitat of marshland, grassland, eucalypt scrub, and pond habitat, much frequented by birds. It ends just against one end of the airport.

There is lots of good murky water nearshore, which is what I suspect these dolphins like—the tide is low, with much glistening mudflat exposed. We fly offshore about 5-6 hundred meters.

Dugong spotted off the mouth of the Boley River. It came up, by rising with the tip of its snout exposed unlike a dolphin. A lot of muddy water is issuing from the mouth

of the river. It sweeps out in long plumes below us. Some whitecaps begin to show, but for the most part the water is fairly calm.

Now along shores of Magnetic Island water is cleaner here as we leave the mud plume from the river. The dugong, by the way, was a pale tan. I have the outboard seat in the L rear. We fly 300-400 m offshore and I look out to sea on this traverse. We circle in a bay with many boats anchored. We saw what looked like a dugong. It rose as a brown blob and then sank directly downward. It did not come to the surface and arch as a dolphin would do.

July 30, 1982

Townsville, Queensland, Australia

George picked me up at 6:30 this morning, we loaded our recording gear in his car and headed for the Biology boat yard as the sun increasingly lit the surrounding hills with apricot light. We met John Robertson and a friend of his and headed for the main boat ramp at the harbor. We will launch our Stacer runabout (outboard powered) and head down off the flats south of the harbor and to the north coast of Cape Cleveland to see what animals we might have sighted from the air on the recent flight, and also to see if we can record a dugong.

George brought "tea" for us all, and I have tucked the Lockheed recorder and its batteries up under the bow deck, put the batteries in a rack there, and generally set things on diving suits to cut down shock and to protect from possible salt water running up the deck. That precaution proved a sensible one as when we went out into the harbor I noticed that there was water on the afterdeck and that it seemed to be rising. Indeed it was because we found the drain plug sitting in the motor well. John put it in and we were then able to pump the deck dry again. No harm done.

The day is calm and there are cloud primordia standing about, covering perhaps a third of the sky.

Off White Rock Bay, in quite shallow water we came upon a school of dolphins, perhaps 8-10 in all, which we later came to believe was a mixed school of *Sousa chinensis* and *Orcaella brevirostris*. The others at first felt the school was all *Orcaella*, and I felt it was all *Sousa*. I had seen a snout on one animal, and the others had seen the blunt head of another too. On closer inspection we could see that the fins of some, which seemed blunt-headed were quite falcate, while the putative sousas were more triangular, though even they show a slight degree of falcateness. I began to discriminate a constriction and folding on the necks of the orcaellas. We recorded two bands of this possible mixed school, with, I think, the hydrophone hitting and dragging along the bottom, which means we were in less than 10 ft. of murky water.

The pattern all along is for us to hear loud single bangs at the beginning of tape bands and for them to become less obvious as the band wears on as the animals swim farther from us. This makes me think that these single pops are animal sounds. I hear no click trains. To summarize, I believe we encountered both *Orcaella* and *Sousa* today, and that they swam very intimately together, but when harassed separated into two pure schools. From *Sousa* I continue not to have heard well-organized click trains but only scattered and sometimes loud clicks. *Sousa* has always been found in murky water, and in this case that's where *Orcaella* is too. *Sousa* seems to upend and muck in the bottom. It sometimes leaps and once we saw it clear of the water today. It seems without marked

pattern except for what look like worn places on its fins. It blows. It is slow moving generally and tends to raise its snout out of the water when chased. Even then it moves pretty slowly and never seems to leap away. Instead it tends to take evasive action underwater, coming up in unexpected sectors. Its groups are small and one can discern adult-young pairs and subgroups with only adults. Its school are often very disperse with animals 50-100 m apart frequently, though not apparently in flight. Its sounds are very hard to discriminate from the ubiquitous snapping shrimp except they seem louder close up. Is this an adaptive feature? Click trains would be discernible, isolated clicks are very difficult to tell from shrimp. Whether frequency analysis will allow this I don't know. If we saw *Orcaella* today the intimacy of its schooling with *Sousa* is impressive. *Sousa* follows shrimp trawlers just as bottlenose do, and swims along close to the trawl (to catch stressed fish?). I know no other odontocete that does that, except *Tursiops*. I wonder if the accumulation of *Sousa* near Double Island has anything to do with the use of that island for an anchorage for the boats. I wonder what *Sousa* is doing bringing up trails of mud when it is feeding. Does this have anything to do with the very stout jaws of the species, as compared to most other forms?

July 30, 1982

Townsville, Queensland, Australia

We had hoped today would be like yesterday but no luck. Last night about midnight it began to blow things off the clothes line. One towel left the deck, scaling two apartments down. It hadn't completely calmed by dawn when I arose, put myself together, and stumbled out in the hall to see if I could construct a cup of instant coffee. I made it by pouring hot water in the nearly empty bottle. They make hot water here with a crockery pot that has an element in it that is immersed in the water. The crockery is always green and gives the water a greenish cast, making me feel certain I'm swallowing Paris Green.

Anyway, stomach growling (no breakfast this time of day), I met George in his Alice Springs Falcon and off we went, meeting the St? at the harbor. Calm enough there but outside we could see white caps and sure enough, just past the jetty and we began to buck into it and continued to do so all the way to White Rock Beach [map]. It was a rough, banging wet trip. My glasses were constantly covered with salt—a major nuisance.

It just got worse, we finally ducked into White Rock Beach for tea and coffee. The south wind whipped over the 500 ft. mountains and down the canyons and out onto the sea.

Spotting was most difficult and recording wouldn't have been much better had we seen anything but sea eagles and silver gulls.

We fled for Townsville harbor and once there ended up cruising in calmer seas around the lee of Magnetic Island.

That island is covered with eucalypt scrub except in the canyon where some rainforest trees look dense, broad-leaved and green, where *Auracaria* trees grew from bouldery hills where brush fires couldn't touch them.

At the NE corner of the island I saw a dugong near two anchored trawlers. It's nose, head, and shoulders were above water. With a quick flip of water it dove and was gone. Though we waited we didn't see it again.

Back at campus I snoozed a bit after washing various bits of gear of salt rime. Tonight we take our scientific hosts out for dinner. We pack up for tomorrow's departure to Sydney.

April 5-9, 1983, Granite Mountains

April 5, 1983

Bunny Club, Granite Mts. San Bernardino County

We came in in the afternoon of Saturday, in a cold blustery day. The trip down was one of escape from the rainforest of Santa Cruz, out into the starry night at Paso Robles, over across the valley to the Kern River and up to Upper Rich Bar camp, which was closed.

We found a place to pull off, go down the hill to an old road where everyone could lay out their bags, some I'll admit on pretty wet ground. My bed was pretty much a mass of gopher holes and mounds, but somehow I slipped my corpus in between them and the rain never fell.

Up in the morning only five hours after we slipped in the bag. I forgot to mention the car that clattered up just as we were trying to go to sleep. It contained two drunks, one passed out utterly and the other driving. The awake one wanted conversation and some information about how far it was to Bakersfield. It seems he had no tire on one front wheel and was driving on a much battered rim, the remnants of the tire hanging on. We sent them on to the next camp.

Anyway, up over Walker Pass amidst heavy wind and some snow on the ground. I snoozed a bit, we gassed at Johannesburg and shopped at Barstow and headed for the mountain. Dinner, bed.

Today was spent taking two groups out to observe. We looked at pollination mechanisms on the desert almond and tent caterpillars. Richard found us a bee hive in a crevice down the wash below the main pond. One could see two new combs and hear a deep hum like a fan motor going, issuing from the crevices and there were some bees crawling around on the combs.

Dinner, singing with Olga and Richard and Pam and Gary. Only Gary can carry a tune. Then to bed. Steve's great and Larry does his usual wonderful organizational job. Two of our troops have a hacking cough and flu. Bob Vandergrift and Shawna Harvey. Poor folks. They try hard even so. Off to bed. The cacomistles (2) put in a brief appearance.

April 6, 1983

Granite Mts., Bunny Club

It's night (9 PM) and we are gathered in the cabin under the Colemans, 23 varied folk writing away under the lights about their day's experiences.

We saw old Dr. VanDenburgh on the way in, no beard, white hair, on a bicycle—we knew it wasn't going to be easy.

On the way in it began to snow just as we left the freeway. By the time we reached the cut off, veils of snow pattered wetly on the windshield. The bus turned into the dirt road and promptly became so stuck we could go not an inch in either direction. It took an

hour and a half to dig it out, after removing the spare tire which was jammed against the ground. The class dug with a will, my only worry that they would kill each other with their their vigor. How to keep the diggers in back from killing the folks under the bus was the problem—but we persisted, the snow stopped and we traveled uneventfully to the road above the cabin.

Next day I took two groups out in a fairly bleak day. We did well though, beginning to learn about how bees orient to their hives and how tent caterpillars make their nests. We came home singing across the bajada after the last session, the temperature dropping down below 50 deg. F.

A nice dinner, excellent talks from the physical factors group, notes and off to bed? We'll see.

April 7, 1983

Granite Mts., Bunny Club

It's the end of a long but good day. I've taken the day with two separate groups of six students and we wandered along the mountain base. On the first we wandered along the wash to the pond and spent our time trying to understand swallow flight. No simple task either, with things happening faster than the eyes could see. We watched them swoop and circle, flutter and dive.

But before we had spent half an hour at a kettlehole pondering surface tension and how animals deal with it. We tried to understand how they breathed—it seems they use a snorkel—really—a black tube from their upper tail. It ends in a hooked flanged affair that quickly pierces the surface film and suspends the larva head down. The larva is attacked by another insect larva—a segmented dragonfly larva-like animal that swims horizontally and when they are very close to a hanging larva they attack with a jaw snap. Most larvae escape but some don't. The head-down position, the lateral wriggle or snap, and long setae from each segment protect the larva—not unlike the head-down position of the fur seals, the better to see sharks and other predators from below.

The day was never very warm but at least the sun shone and in the wind-protected nooks we could warm up.

It's a grand, responsive, talented group. They emerge and all fit in and they begin to care for each other. All are eager and thoughtful and tend to helping us. Talents range in many directions. To watch them unfold, to return to childlike wonder is in itself wonderful.

April 8, 1983

Granite Mts., Bunny Club

Today was our touring day, so early we all finished breakfast and piled into the old blue bus. Matt Miller and Steve drove today, sharing chores. They, and Larry Ford, are licensed to drive the bus so I just stand up in the door well and watch the scenery go by.

We now have a powered "bullhorn" that lets us mention the interesting things as we go by. It really helps add information, and lets us guide things much better. It suffers, though, from the problem of overuse. I feel it is an intrusive act to break in, like a phone call, but judiciously used, it's a wonderful way to tie things together.

We headed for Kelso and gamboled on the green lawn while various phone calls were made. To our considerable delight Dr. VanDenburgh put in an appearance that bade well for our later adventures. He appeared in the form of section hand on the railroad in oversized dirty coveralls, a hard hat on his head and a seedy white beard jutting out. He lurked near a building corner and then retreated around it and disappeared. We looked and he was nowhere to be seen.

The day was sunny, for a change, and warm enough to expect a few lizards to emerge, and maybe a rattlesnake or two.

The ride up Cedar Canyon is one through a serial panorama of vegetation types. At the Cima Rd. we were in Creosote scrub. Before long it gave way to Joshua tree woodland and *Larrea* disappeared altogether. Then we entered a rich *Hilaria rigida* prairie apparently located on the deep alluvial soils that spread out over the fan from the mouth of Cedar Canyon. We turned toward Hole in the Wall and before reaching it entered juniper-Great Basin sage, thence into blackbrush and thence into a lovely high-desert bunchgrass prairie, where we turned off at the Rocking L ranch and made our way down to Gold Valley.

Jane Southcott was there, recovering from her hip operation, given company by her cats and deaf old snaggle-toothed dog. She welcomed me with open arms and invited us in. She also quickly had us tend to two crucial things she couldn't, on her cane, do—put gas in the truck and look in the tank to see how her water level was. She seems frail and full of concern about being by herself. She's built a little apartment for a caretaker and now has to find one. Two of our gals, Denise Polk and Lorna McNeil, plan to do the vegetation of her ranch and will help some, but not enough I fear. I'm not sure what she'll do.

She invited us to hike her mountain and showed us the way up a ridge behind the house. Then we attempted to record the dunes. Alexa Dvorsen had a cassette recorder and a mike. I had encased both in plastic bags so we stationed Alexa $\frac{3}{4}$ of the way down the slipslope and had fleets and echelons of naked sliders go by, making the mountain boom. I stationed a second time and again the fleets came. Tony Smith sailed by like a ship making a long boom as she went. Our playback was inadequate but we think we have a fairly decent tape.

The day had grown hot enough to heat our feet dangerously close to burning, especially over the windows of magnetite rains. But we all made it without mishap.

The vignette of the day was from below on the dune face of the class on hands and knees making their way back to the top for another slide, humanity reduced to its essentials struggling upward toward a distant crest.

The afternoon was a fairly lazy one, people getting caught up, taking baths in the trough, notes, just gabbing.

We had a good presentation about land use on the desert, excerpts from old newspapers about attitudes toward Mojave indians, a grand vignette of a family visiting the desert for the first time, a piece by Suse Shane on ORVs (very well done, and more). To bed.

April 10, 1983

Granite Mts., Bunny Club

Today is an open day. Steve and Larry led one group to Granite Peak. I puttered around the cabin and then in the afternoon Tony, Jeanine, and Mary Kazah went up the saddle trail toward Cottonwood Gap.

Robert Wiener and Jeanine Pollack came across what was probably a ground snake (*Sonora semiannulata*) about halfway up to the gap. It was described as olive above with orange spots a bit less than fingernail size (1/4 cm) apart. The spots were 1-1 1/4 cm in length across the midback and going down either side. It was stretched out on the soil of a rocky hillside amidst cholla, juniper, cat's claw, and more herbaceous plants such as *Sphaeralcea ambigua*. The day was cool, breezy, and partly sunny. The snake went down a rock crevice into rubble buried in the soil. We could not catch it. I did not see it, unfortunately, but I did see where it went.

Another find, Paul Edelman brought a *Sceloporus o. bisiriatu*s back from Granite Peak (male), where it was caught right on the USGS marker. So the species goes clear up, making it less likely we will ever find *S. graciosus*.

It was a slow day letting people gather their wits, get notes in order, and tomorrow we head for home around 7 AM.

June 2-6, 1983, Mono Lake, White Mountains

June 6, 1983

Thoughts on the Spring 1983 Field Quarter

Grandview Camp, White Mountains, Inyo County

Our intense days together draw to a close. Lately we have become more ready to laugh than study, more ready to stay up late gabbing in the glow of pinon coals than to sleep in preparation for tomorrow's work.

We huddle and hug. An arm trails over the neck of a newly dear friend.

High on the hunched shoulders of this massive mountain we know that tomorrow's twisting descent through pinon parklands and into the pre-Cambrian cleft of Westgard Pass is the end of a passage.

It is always so.

But the end of this particular passage has deep poignance because it has been so pure. In our circumscribed world of 26 we have built a subtle set of rules that have allowed each of us to question, to wonder, to touch the earth and each other without feeling foolish. It has been a place of laughter and a place where we could rest when we needed to. We came to know the essence of each other and from this came trust.

And we have had a magnificent quest. "Can we come to know the life pulse of a mountain, or a desert bajada, or a forest? And can we reflect such knowledge on the tangled human affairs outside the bus? In our beginnings, those long weeks ago, many of you were apprehensive. So used to striving toward some one else's measures that few really believed that one's personal passage was all that counted. Nor did many believe that we each (and I include Steve, Larry, and myself) would make the journey in his or her own very personal way.

But these things were there. No two windows-to-the-world would have admitted the same landscape.

How lucky Steve, Larry, and I are, really, to have shared this time with you all, every one. Because our understanding has also unfolded we are as fresh as any of you, and we too think about "Life After Babylon." When else will be able to compare seduction experiences with anybody? Waking without the clatter of pans, the click of knives dicing fruit, laughter mingling with the rush of nearby water and the morning chorus of birds will be bland.

Soon we will go to bed without looking first for stars, unscented by willow smoke and without a haunting indian chant and the clear lingering liquid notes of the flute.

But what of our quest? How far did we get? Are we any different for these weeks? Back home we speak piously of Ecology and to many it has become a banal buzzword of a generation. Can we see it, feel it, think in its terms?

In the desert we saw that plants ordered themselves in often subtle assemblages which only Steve could reveal to us. More evidently across some invisible line creosote gave way to bunchgrass or Great Basin Sage. We learned a little to see, to poke our noses close to tiny ponds to see how mosquito wrigglers breathed, and we wondered about complexity and adaptation as fearsomely predatory insect larvae swam toward our wrigglers with great cocked jaws, only to be deflected at the last moment by the wriggler's long setae. At once we understood those long hairs.

Once we saw the setae fail, the jaws clapped closed and predator and wriggler sank to the algal pond bottom of this microworld. It would never be the same.

We looked at a scarlet columbine nodding by the road's edge and speculated about the guardian form and color that excluded most pollinators apportioning sweet nectar to the few who could hover.

The Matolle River returns home to the sea, a quarter of a mile from our grassy riverbench camp. As Rachel put it, her spent waters pour from the veins of the mountain, only to be drawn up again into clouds that wreath and flow among the battered Douglas fir stands above us. We learn from feeling the power of the Matolle and from building tiny dams across her impatient rills that she, the clouds, the sea, the trees, and the land have one pulse, and are ineluctably one.

Even with this before us we struggle to see, and especially to think about the whole instead of its obvious parts. Linear minds from a linear society must build entirely foreign processes of thought to truly know in this domain.

Yet it is clear that this is our central struggle, one lodged deeply within our unprepared minds. On we go across northern California, the Sierras to the starved shores of Mono, the garden of Deep Springs Valley to our camp on this rim above Owens Valley.

We search for clues. Mostly we see that our precious view of a systemic world is not violated. No linear thing or process stands before us. And linked things are everywhere and what we cannot truly see speaks of great subtlety in such things.

Similar incomplete clues and similar lack of countervailing cases tell us that animal relations, the behavior of humans, and the construction of cities and farms are likewise systemic. Can we take our lessons from these mountains, islands, deserts, and

rivers back with us to shape human responses to present outmoded social constructs. That is the next, and ultimate challenge.

Maybe in some way, dimly perceived and not understood, our blue capsule and our odyssey themselves contain such answers.

KSN, Grandview, June 6, 1983

September 1-9, 1983—Tahiti, Moorea, Bora Bora

September 1, 1983

Los Angeles International Airport

Well, I learned long ago in field work that luck runs in streaks. If it's bad, it'll go away after a while.

The day before this trip to Papeete, Moorea, and Bora Bora with John Pearse and his wife Vicky, was awful. I couldn't seem to do anything right. My daughter wanted to borrow my pickup to drive to Idaho and I wouldn't let her go till I changed the oil and I left the plug out while adding the new oil. I burned a hose in half melting blocks of asphalt. I backed a tractor into my wife's pet dogwood tree and snapped it off, all this after getting a call from Joe Loug telling me he wanted to get the tickets, not me. Oh my!

Then off to the airport and down to LA where we expected to be met for a ticket exchange but weren't, and then onto a big Qantas 747. We took off OK at 9 PM, but no more than half an hour out the captain came on in his good Aussie accent with "This is your Captain. A minor part has failed, and Qantas, with its fine safety record blah, blah, blah"

So we turned back to LA, circled for an hour and then were hustled off while the plane went off for testing, came back and we went aboard again. The part was finally replaced but the mechanics went off shift before the engine could be assembled. Then Qantas announced we were being sent to hotels. At 5 AM we arrived at the Sheraton something-or-other, I was paired with a smiley black pentecostal minister from Melbourne and we went off for some sleep. Right now I'm in the lobby and we go back on board at 2 PM. Then because I saw a magnificent Dr. VanDeburgh before the trip, somewhere along the line the clouds will part, the mist will clear away, and we'll have a helluva trip.

For readers who don't know about Dr. VanDeburgh—he is the patron saint of field trips and he appears before us in various guises which we can learn to read for information about the trip ahead. He wears green or brown, usually, or blue, if you're facing lots of rain. And he has a white beard—the whiter the better.

The one I saw had a grand beard, rode a bicycle, and was all in green. Very auspicious, Dr. V. but when do you go to work, my good man?

Now why John, Vicky, and I should be off to exotic Tahiti—Mr. Joe had mentioned to me long ago that I might like to go to Bora Bora, where he has a hotel, to look for porpoises. Then things got so sticky in Hawaii that I terminated my spinner porpoise project there—the drug scene, violence, dirty water, and too many animals, which keeps us from following family lineages very well.

So I asked him if the offer still stood and he arranged it. Director Bill Doyle of the Center for Coastal Marine Studies asked if John Pearse might go to look into invertebrate

opportunities, and because Bill couldn't go, Vicky substituted. She will be invaluable because not only is she a fine invertebrate zoologist, but she speaks French which neither John nor I do.

We hope to look into opportunities of all sorts for the marine program. Can we establish a tropical arm for our students and researchers? We will visit Papeete, Moorea, and Bora Bora. Praises be, Mr. Joe has set up complimentary rooms for us at his hotel Taharaa at Papeete and his Hotel Bora Bora in Bora Bora. At Moorea we will stay at the Gump House adjacent to the fledgling marine station. Mr. Gump is helping to establish at the site below his house. I'll be looking for porpoise schools, clear water, cliffs, to set my surveying instrument up, a peaceful congenial place to work, and small dolphin schools.

So, let's see what this day brings. The dawn, I hope.

September 2, 1983

Well, after a good night's sleep, breakfast and a lot of standing around, we trooped back on board the same plane and at 4 PM began all over again—same cold towels, veal something or other, bar service, movie, squirming in the seats, and pacing up and down the aisle to shake out the kinks. About 9:30 PM we landed on the [?] runway, went quickly through customs. Our agent was a giant Polynesian without a smile whose hat perched incongruously on his huge head. He stamped things and we were off. A 14-km taxi ride took us to Mr. Joe's beautiful hotel Tahara'a at Matava Bay. It steps down the cliff as a series of terraces overlooking this arcing bay. The beaches are black sand and across the open water one can see Moorea, a dark greenish castle thrusting up from the ocean. Each of us has a terrace lined with flowers. The trip through Papeete was on rain-washed, almost vacant streets. In the dark it looked like the lush parts of Hawaii. Cascades of white plumerias, big mangoes, and beach almonds (karmani trees), octopus trees, and so forth. The air smelled heavily of perfume from these crowded trees.

A good, good sleep and next morning while eating breakfast on the porch, John and Vicky spotted a big dolphin school offshore in Mataai Bay. I guess 60-70 animals and I'm sure they are spinners. They were spread out over perhaps 300-400 m of water moving back and forth. There was some aerial behavior, but no spins, just head and back slaps. I'd guess the school was out 1/3-1/2 a mile. I could just make out fin shapes. Some seemed somewhat falcate and I thought I saw some canted forward.

The animals were moving fairly rapidly and going back and forth. I don't think they were in real resting formation, but perhaps descending to it. I could not be sure but it looked as if there might have been a reef beyond them (probably not) though not nearly so well marked as other reefs on both sides of the bay. Pt. Venus is perhaps 400 ft. high and would be an excellent theodolite location. Beyond the reef on this calm day there was a lee of calm water that didn't grade into wind chop for on the order of five miles offshore. So deep oceanic water is at least sometimes available for small boat work in the lee of Tahiti. The wind blows around the W. end of Moorea leaving a lee between the islands.

We were told that only yesterday the spouts of whales had been seen just outside the reef.

After much discussion we decided we had to head for Moorea today because the people there were waiting for us and because of our tight later schedule at Bora Bora. So, having missed the morning ferry we decided to fly over rather than wait till late

afternoon. Down to the little airport through the lush vegetation tiered up the steep hills. One could see that the tops of most of the trees had been blasted off by the hurricane of last season. They told me of 100 mph winds up at the hotel. Ed Fearon, a co-owner with Mr. Joe told me of partitions popping like corks on the verandahs, roofs sailing away and windows bending and exploding inward with the blast. The first such storm to hit since 1906, I believe he said.

Anyway, we flew in to Moorea and the ambiance was noticeably slower, even at the airport. The car ladies played scrabble and the taxi drivers smiled. The island, like Tahiti, is a high volcanic island. Moorea is a giant caldera of an old crater. Two of the bays that cut into the island enter this caldera. Left are ramparted cliffs, fins of lava, and vertical walled peaks that usually pierce into the misty clouds. A fringing reef defines the outer margin of a rather shallow reef flat, sandy nearshore, and increasingly crowded with coral heads toward the reef.

The water over the reef flats is startlingly clear in places though the deep bays are murkier (probably simply from depth).

We tried to find Luci Terhotua, the husband of Nui Terhotua, who is the local mayor. Both work for Mr. Gump, as does Luci's brother, Charles.

Finally we did and she lost no time in telling us that we couldn't use the Gump house because she and her four kids had moved in while her house, damaged by the hurricane, was being finished. She is a big, smiling, dominant Tahitian woman of 35 who, I believe, moved in after George Barlow had a falling out with Mr. Gump in mid August. We are "Barlow's boys," I think, and Luci, knowing where the power lays, made her move. In my view, if we were ever to use the station it was best just to swallow the situation, and take a nearby room. So we got her to set up a room at this nearby hotel for us at some reduction in price and then her brother Charles took us out in a fishing skiff. It's Friday, the fishermen all fish on Saturday. They go to church (Protestant) on Sunday—no boats—so today is it.

Sighing a bit, but recognizing that this sort of thing is standard grist for invading a new area, we signed in at the hotel—a collection of nice, thatched bungalows on the beach north of Cook Bay.

Charles, a beefy, pleasant French-speaking Polynesian (part), produced a fiberglass boat of about 15 ft., deep V bow with steering in a well very far forward, two Merc outboards, and a tiny string for an anchor line. Off we went, into the calm Cook bay toward the entrance. Vicky translated for us and we headed out to traverse up the coast outside the reef. Not long after leaving Vicky and then John sighted jumping dolphins in the choppy seas. Finally I saw them, dark shapes leaping and falling on their sides 1/3 mile out in the blue water from the reef. We closed on them, and formed several widespread subgroups over perhaps 1/4 mile of water. They, much to my surprise, proved to be stenos—rough-toothed dolphins, and perhaps 30-60 in all. It was very hard to say because of swells and chop.

I saw their large, sometimes ragged fins, their bodies splotched with scars, mostly from cookie-cutter sharks, but some much larger, grievous-looking wounds that must have come from large sharks.

We circled amongst them, watched them leap in their typical aerial behavior—an arcing leap, a turn onto the side, and a falling crash into the water again. Just like Hawaiian stenos.

We reentered the bay and cruised westward toward Oponohu Bay. We cruised into it clear to the back end. Its center is deep and dark—15 m or more, but the edges are dotted with scattered fishermen's and other houses, one a grand green tin-roofed place owned by an American. At the back of the Bay we could see the buildings of the French marine station, "Centre de l'Environnement" run by an ichthyologist—Rene Galzin, George says he's a pleasant guy who speaks a little English.

We cruised west of Oponohu Bay behind the reef. The boat channel, well marked by painted metal poles, let us follow a tortuous course among coral heads, some of which were nearly awash. It was a grand ride over clean coral bottom 6-7 ft. deep, amidst table corals, a blue coral, large brown *Porites* and scattered fish. A heron that looks much like a reddish egret stalked the shallows, brown boobies skimmed over us and a large tern croaked its rubberband sounds from perches on exposed coral fragments. We skimmed the glassy water, now calm and clear, that must have been a maelstrom during the storm as here and there we could see coral heads tipped up and out of water.

We went out to entrance of Oponohu Bay and not a quarter mile outside we came into a school of what I'm pretty sure was *Tursiops*, the bottlenose dolphin. It was small for the species, but the dark color, the well-developed beak and melon, the large falcate fins and its behavior all converge on that species. Several times I saw pairs, trios, or echelons of more animals riding inside wind waves. Some swerved near our bow. Most were probably at most eight-footers, and most were more like seven ft. None of the big brutes we are accustomed to in the Gulf of California, or off the California coast, were seen. I'd guess we could see groups that numbered 30 animals or so.

Vicki has been translating well for us though her gentility means we must pose most of the questions. Charles is a good respondent who does not tell you what he doesn't know—refreshing.

Then we stopped for a snorkeling excursion at the West entrance of Cook Bay. John is looking for groups of *Diadema* urchins, as possible subjects for a field class sometime. Though the reef proved interesting it had very few *Diadema*.

The shallow reef flat extends right up against the back of the fringing reef that extends up to tide line. The density of coral heads increases in that direction, too.

Charles anchored his boat on a coralhead using a bamboo pole with a big hook at the end and a single piece of twine to the towing eye. We dove in, leaving him floating on the glassy water. Then began a long snorkeling wander toward the fringing reef in 4-5 ft. of water. Mostly one steered carefully among the hard corals to avoid being scraped.

We saw almost no soft corals, so prevalent in the Barrier Reef, mostly table corals and a heavy brown *Porites*, a blue coral John couldn't identify. The stag horns were largely gone—I could see fragments on the clear sandy patches. In the *Porites* were two kinds of serpulid worms, their respiratory trees out. One was brilliant, brilliant blue, a red and orange and a striped one. They snapped in as we came by, or extended a finger forward. Small *Tridacna* clams (5-6 in. across) were as brilliant—iridescent greens and blues on their mantles. The swash of a swimmer would cause a slower closing, usually not complete.

Joh showed me the Cuvierian tubules of a giant sea cucumber *Actinopygea*. These two-ft. long brown or tan cucumbers had small light circles stamped on their backs. When one picked them up and stroked their venters, a mass of whitish tubules promptly extruded from the arms—like a mass of fine white spaghetti waving in the water. If one

touched it, it immediately adhered to the extended finger and one became enmeshed in a tangle of incredibly sticky threads (they rupture a membrane to extrude them). They do not, I recall, stick to each other. How does that work?

The fish fauna was rather modest, I thought, though one could fill in a long list after a time. Whitish lizard fish scooted on the white sand adjacent to coral heads. Lovely, iridescent, pale-blue *Chromis* schooled among coral branches and took refuge when I neared, flashes of blue deep down in the coral head.

A lovely, six-inch, big-eyed, bright-orange fish that I suspect of being a Pomacentrid, was common. I saw perhaps five kinds of butterflies, olive Acanthurids (surgeon fish), but very few wrasses, only one scarid and no parrot fish at all. All in all, invertebrates and fish, the reef is a specialized one, very unlike others any of us have seen. Urchins were few, John found only three *Diadema*, but many of a smaller Strongylocentrotus-like form (*Echinometra*). John says it's one of the most widespread of Indo-Pacific urchins.

I saw some *Fungia* (mushroom coral) and the reef was heavily populated by waving columns of a brown alga, *Turbinaria*. There was also a filagree-like brown[?] that gathered in great heaps among the coral heads (*Hydroclathrus*).

We swam back to the boat, came in, and jounced back to the hotel in the back of the truck (Luci says "Men in the back"). A good dinner, a free Mai Tai, which practically levelled Vicki, and off to bed which included a modest bout with mosquitos. Our Fale[?] is permeable indeed to the little critters, there being no screen on the louvre doors.

September 3, 1983

Moorea, Hotel Moorea Lagoon

Charles is scheduled to take us around the island today. John and I will look for a general ecological opportunity for our students, and for us, who might work out of the little marine station now in the works. It now consists of about one acre of fill at the edge of Cook Bay, below the Gump house. We launched there yesterday.

I called Phylly to have her call George Barlow so he could try to alert visitors subsequent to us that no house was available. All's well at home and our connection was immediate. Magic!

At 9:30 Charles picked us up in his Peugeot pick-up. We gassed up at Cook Bay and drove up a central loop road that goes back in the caldera and up against the face of the cliffed mountains. It's a spectacular drive. The road at first traveled through little patchy farms separated by trees. Often these were groves of a closed-cone pine, planted in rough rows, growing straight as a die uproad. I wonder if it is a tropical permutation of our Monterey Pine (*Pinus*) such as is widespread in the southern hemisphere.

The flora is much like that of inland Hawaii, poinciana trees, Java plums, mangoes, guava groves all tangled and nearly impenetrable, Han jungles, and even a slim, spindly relative of the ohia tree (*Metrosideros*). Many flowers graced the way and colorful foliage plants, mostly familiar—*Almandra* in lovely yellow-flowered banks, cohias, ti, hibiscus, ginger, and more. *Taconia stans* with lovely yellow trumpets was common like the *Plumeria*, an import from Mexico.

Near the top of the road we came to a pair of ancient marae, or stone temple platforms with scattered vertical stones, like headstones in a cemetery. In one there were also three box-like depressions about the dimensions of an apple crate, that we learned

from Charles were crypts of kings—small kings these, or good packaging, one or the other.

The marae stood in a forest of tropical “chestnuts” (*Inocarpus edulis*—Fabaceae); these with wonderful finned buttressed root systems and blotchy tropical tree bark. To one side a stream ran tinkling and gurgling over stones. In it we found a prawn-like *Macrobrachium* that pinched and probed at John’s fingers when he held it. I saw a little goby. On the banks a lovely, slim, blue-tailed skink scuttled amongst the leaves of the forest floor. There were several spiders and worms of interest—all in all a beautiful mid-Pacific forest environment.

Oh, I forgot the ferns and epiphytes which were prominent and varied. There were tree ferns deep in the shade and tangles of a sort of tropical bracken in the sun, single-bladed ones in clusters on tree trunks and compound pinnate ones on the forest floor.

We followed Charles through the shaded trail to another marae, this one a magnificent platform maybe 60 ft. long, backed at its upper end with a kind of tiered stone temple which faced across the alley at the magnificent fin of rock that was the major mountain (Mut Rotui) separating the two valleys, which coalesced under our feet. One tier of the marae was of rounded cobbles from the sea shore, the next slabs of flat mountain rock, overlain by another tier of cobbles etc.

There were, as I recall, five or six such tiers. [Drawing.]

Then a little spin took us up Belview lookout. We stood against the cliff of the west mountain which rose nearly sheer 2,000 ft. above us, its sharp peak mostly shrouded in fleeting clouds and vapor (Mt. Tohivea, 1212 m). Except where it was truly vertical a fuzz of vegetation clung giving the entire mountain a green cast.

Ahead of us we look down two valleys to the sea, down Cook and Opinohu. Dividing them is a giant cliffed spine of volcanic rock, rising at least 879 m between the valleys. Fins and dikes of rock were etched here and there into castles of stone, fingers and walls snaking up the green slopes and clothing all the gentler land hung in between is a leafy airy forest. It has been said somewhere that this is the most sublime vista in the Pacific. I know only a few and can’t judge but in my collection few match or approach it. Nature still reigns here—the green valley, the blue sea, paling to turquoise over the shallows, the white and grays of clouds, the ashy black of volcanic rock layered and piled by an ancient volcano whose heart once was searing with molten rock right where I stand.

I reacquainted myself with the candlenut tree, a lovely tree of pendant heart-shaped leaves whose gray cast makes them stand out from the darker forest when one looks at the sweep of a hillside. A dotting of them could be seen against the far northern arc of the valley, up against the place where rock rose vertically, leaving the tree cape below.

I traded with John, taking the bench set across the bed of the truck and rode the rest of the way there in the warming day. Only miraculous sunscreen kept me from a fine sunburn, but lily legs emerged mostly uncolored.

We headed west around the island on the circle road that travels on the nearly level apron of land at the mountain’s base. It is a rural band, but houses and people are in most scenes. It switches from sandy flats feathered with long, limber, well-spaced coconuts to denser forests of karmari[?] and hau[?],—and slopes dense and inhospitable with hale koa. Now and then we crossed the tiny estuary of a freshwater stream. Some smelled. Most had flowing schools of small silvery fish, probably mullet.

We stopped to push a bus at a park where a yearly taro contest was just finishing. Contestants brought in the roots they had raised and they were weighed. The heaviest was 64 kg., a giant brown root.

On we went. Now and then a pass through the reef appeared and I watched for fish, which I did not see. The two best passes were next to the channel between Tahiti and Moorea. These came in as broad bands of dark blue, into the deep channels inside the reef, with white breakers piling on the reef on each side. I think they bear watching as dolphin schools could enter. Because they are fairly close to the cliff, they would allow the use of a theodolite if animals were indeed there. Only study will tell.

As I write, two beautiful little finches have foraged up within a couple of meters of me. Olive-backed, gray-breasted, they have crimson eye masks and crimson tail coverts. They are half the size of some North American finches.

At the airport we dealt with some ticket problems and then came back to the hotel.

Resources for teaching and research are here in some abundance. The upland forest, its streams full of creatures that could somehow traverse thousands of miles of salt water, the trees, the fern flora which is another disperser carried by spores, some in the stratosphere. The dolphins need reconnaissance study. So far, I doubt that this is the place for a long-term study of their society, but the very species that live here and their characteristics remain unknown. Problems of tropical agriculture, mariculture, and society are here in abundance. Charles is one of 15 children of Protestant family—all live on Moorea and have 20 children themselves. It's filling up. Native culture contends with tourist culture. Population goes up hundreds each year.

The reef I'll leave to John and Vicki, but I can see it as a wonderful introduction to the tropical marine world for students. The fish, the coral, the indwelling worms and urchins, the in-fauna of the sand, the signalling systems of *Chromis* schools and *Dascyllus* schools, the sensing of goat fish, whose barbs are used to probe among the sand grains for food, sea cucumbers. There is a tropical marsh by the airport. There are mudflats alive with life.

We stopped in at the French station at the head of Opunohu Bay and will return tomorrow. They do various sorts of invertebrate work and there is an ichthyologist on the staff. There is a pond culture program raising *Macrobrachium* prawns next door.

We did a little snorkeling in the afternoon. All of us saw a good deal more than on the first dive. I checked families of fish and found snappers, goatfish, parrotfish, a goby, the parasite-picking wrasse, and other wrasses such as *Gomphosus*, a kihi kihi (Moorish idol), and Vicki and John saw boxfish. *Balistes rectangularis* is common but is the only triggerfish I saw.

The sea is clear and sparkling in most places. I fear, however, for the future of this place as population grows. How long can table coral persist?

I prodded a couple of big pillow stars (*Culcita*) over. They look like rocks, but once turned over they reveal their ambulacral grooves. John says a pearlfish sometimes lives in them.

In the evening Nui and Luci came in and told us about the marine station plans. They had trouble understanding why we didn't know about plans and we tried to tell them about giant universities and communication problems. Nui is a judicious man of evident probity and Luci I've talked about before.

They ended inviting us to a Tahitian meal. I asked about Mr. Gump. They had much affection for him and had named a son after him. He is 77 and has been on Moorea since about 1961.

They rather spilled all the problems between George and Mr. Gump. Poor George. I can imagine how he feels.

September 4, 1983

Hotel Moorea Lagoon, Moorea

John, Vicki, and I got up this morning, had breakfast, and walked westward to the French lab, Le Centre du Environment. It is located at the very back of Opunohu Bay and consists of a cluster of buildings including a couple of labs, a dorm and kitchen, and places to park cars and fill diving bottles, and the like. It's small and caters to individual scientists without families.

Visitors were there including a coral authority Michel Pichon from James Cook U, Queensland, and a younger man from N. Guam who worked on fishes. Their program is pretty much a survey of the biology of Moorea and mostly non-experimental except in the trophic sense. They gave us a bibliography of some 200 papers published since the station began in the 1970s. The main director is in Paris and only a caretaker is permanent. They were very friendly and most spoke excellent English.

As we walked back past the *Macrobrachium* ponds next to the lab, Luci and Nui picked us up to take us to a real Tahitian meal. We drove to a restaurant across the bay from the Gump place. It sits on stilts out on the bay, woven mats and thatch and a great, high, airy ceiling, and windows all around to take in the lovely bay, black cliffs, the green hills, and the sky decked in cumulus.

The meal was set out buffet style. One took a soup bowl for curded coconut milk and a plate for various goodies and then one ate with fingers—swashing each morsel in the milk. Nui had made for a crock set off by itself and said, "Not for you—raw fish." Since I like raw fish I made for it too. Wow. It was very fresh parrot fish slices anointed with a truly powerful rotted sauce made of fish bones and salt water marinated in the sun for four days. John and Vicki didn't try any but were downwind and that was just about enough.

The rest of the lunch was delicious—taro root, pumpkin and milk, sea food salads, a big mahi mahi, and more.

They dropped us off at our hotel and we snoozed for a couple of hours before an afternoon snorkel.

I saw a lot more this time around—a ghostly goby in coral sand burrows, paired with a shrimp. The sand was full of a tiny sea cucumber—raking the fingers produced dozens. John says there is a viviparous form and that one can see babies lined up inside the body wall.

I was challenged by a beautiful trigger fish (*B. rectangularis*). He had cleared a partial circle on the open, rocky bottom and he didn't want me anywhere near, even when I was two meters or a little more, away from his treasured circle.

He rushed at me and I shoved him away by waving my hands and he would rush again. Remembering their powerful teeth and jaws I left him alone.

As dusk fell the schools of tangs began to flicker over the open, sandy areas and squirrel fish inched their way into the open from below dish coral. I saw a nocturnal

cardinal fish poke its head out and I wondered about the crepuscularity of some reef sharks. They should be on the prowl too. Soon I headed for the beach in front of our little house, and walked amongst the thatched bungalows to ours (ole' 25) and headed in for a shower. John and Vicki came in later and we walked over to dinner (good sauteed shrimps).

September 5, 1983

Hotel Moorea Lagoon, Moorea

This is our last day on this island. Luci and Nui had suggested that we might take the boat out before our ferry.

I asked if we might go to Haapiti, a place Rene Galzi had said he always saw dolphins. His description made them sound like spinners, so needless to say, I was raring to go. John and Vicki will be glad too to see a different reef.

So, about 7 AM Charles appeared and helped us hand our baggage up to the Gump house while we took our boattrip. Somewhat to my surprise Charles launched at the Gump dock and said we would go by boat. Straight out Cook Bay he headed. The sea was rolling glassy smooth outside and we could see a long way. Not long after we left the pass Charles turned the boat east and soon he and John could see fins. Then I did too—a long way off. As we closed on them my puzzlement grew. They were bigger than most porpoises and there were four of them. They didn't roll like a dolphin but often their long back ahead of the fairly large, slightly falcate dorsal lay straght and black at just above water level. [Drawing with caption "very straight until the animal lifts his head"]

Then, the snout was sometimes raised so that one could see it was underslung. [Drawing with caption "undercut snout is very obvious"]

I never saw them blow. When they dove they dove for perhaps 30 seconds, maybe more. I never saw pale marks on the sides. They moved quite deliberately and allowed us within 20 m or so. We stayed with them for about 20 minutes and left.

From head on I could see the animal move its head up and down out of water while the back stayed in the same horizontal orientation to the water.

I'd guess the length at 10-12 ft. in the largest, the fin 2/3 of the way back to flukes and dorsal fins variable [?] large and in one case, with a bulbous tip that could have carried ectoparasites. I'm quite sure we were getting my first real look at *Kogia breviceps*, the pygmy sperm whale. Later Nui called them "otia" (this name was some allusion to a saddle or a horse because their backs bend like horses) and knew they were not dolphins. The fact that he knew them well makes it reasonable that they could be encountered with some frequency. Oh for a rewinding apparatus.

On we went around the west end. The sea grew choppier with a short and not very high wind chop. Charles navigated us nicely from his bow seat which I learn is a pulpit from which they can harpoon mahi mahi. Nui says they go far offshore, 15 miles or more, to find them and located mostly around mantas. The boat pulpit has a tight little seat and a joystick foreward and accelerator at hand. The joystick moves from side to side in a slot. [Drawing] From this seat the driver can maneuver up on fish and harpoon, singlehandedly. They use a stainless steel multipronged version of the Polynesian fish spear. The haft is about six ft. long.

We passed one nice open pass. We could look in the path of clean blue water between white breakers on the adjacent reefs into a clear turquoise lagoon, high volcanic

peaks behind, clothed in green. We passed by and rather soon came upon another clear pass and Haapiti Lagoon. The pass is deep blue water well inside. At the surface was a long trailing mass of *Cladophora*? (*Boodlea*?), a yellowish-green alga. John says it grows on the soft bottom . . . grows up and is shed into the water.

Behind this mat John spotted fins, and sure enough there was a school of 50-70 spinners. They promptly spun for us. I don't think Charles expected them to be there. But I'll bet it is an habitual bay for them,. Rene Galzin said he always saw them there, anyway.

The dolphins impressed me as smaller, a bit, than Hawaiian animals and much more dusky. The white on the belly was suffused with gray. In the water they looked chocolate brown.

Before midday the dolphins made their way out to sea. I was impressed that when we first sighted them they were zig-zag swimming. They were calm and secretive one moment, and moving more rapidly the next. There were clearly marked individuals, one with its fin essentially gone was there.

The water of the pass was dark from depth, where the dolphins gathered, but there was probably 75-100 ft. of lateral visibility. Charles said the clarity depended on currents and that it was often clearer. My poking around about winds[?] suggests that this is usually the lee area, and that like other haunts of spinners it utilizes calmer waters.

The hills behind were close enough and steep enough to place a theidolite station there. All in all it looks like an excellent place for a longitudinal study. The animals are not hunted or bothered according to Charles and others. Whether the school mixes with others is, of course, unknown, but there may be others at other passes toward the airport and Nui says they sometimes come in to Opunohu and Cook Bays.

Thus, whether the population is smaller than the Hawaiian one cannot be foretold, but one thing one can say is that all could be worked by small boat, including that at Papeete, in good weather. The channel between Moorea and Tahiti is only a dozen miles wide and should be easily traversed. By the way, as I write this next morning we are on our way to Bora Bora and as we flew out over this channel, I looked down and could see 15 whales that were probably sperms (they could have been *Mesoplodon*) in a straggly school, only perhaps five miles out from Papeete.

Back to Haapiti. After observing the dolphins for a while Charles put us on the reef right alongside the pass, for a snorkeling excursion. It's a real pleasure to swim with two folks who know so much about the reef as John and Vicki do. We poked in coral caves, flipped rocks on the bottom, to see who lived underneath, and generally snooped over that reef, spouting latin names and telling me bits of natural history.

The reef rises from scattered coral heads back toward the lagoon to become denser and denser as one approaches the sea and finally to coalesce into a solid reef at the sea edge, on which one can stand and walk. There is a change in species, too. It becomes richer and richer as the sea is approached. I was delighted to see large, sprawling anemones, each with a contingent of brilliant black and iridescent blue *Dascyllus*, little relations of the sergeant major. The little fish bathed in the tentacles and had their little tiffs with each other just as the more usual anemone fish do (*Amphiprion*). I saw only one of these, and it didn't seem to have an anemone.

Fire coral was common (*Millepora*) (it's not a coral, but a hydroid, really)—a brown coral changing to lemon yellow on its tips. It is to be avoided as it can give you a

real sting. There were other noxious critters too—the crown-of-thorns was there—I saw perhaps eight or ten. One finds them crouched over coral heads, which they eat. One can usually predict them in advance by the presence of patches of bleached and dead coral. But they weren't destroying this reef, but instead in balance. Only occasional corals had been killed, amidst a sea of live ones.

The fish were a different assemblage in part from those on the other side. Sailfin tangs, brilliant little wrasses, ghastly goatfish, and a bright-yellow-lined rudder fish were everywhere. Crevices everywhere held a brilliant iridescent blue and yellow pomacentrid.

As we swam back toward the boat we looked up and saw it going away at full speed back into Haapiti Bay. So we paddled around for another 20 minutes until it returned. They had gone to pick up coconuts off the beach for us. Two with new sprouts were sliced longitudinally, and the "coconut bread" exposed, the way the growing plant mobilized the food value in the solidified milk. It was rich and tasty.

All three of us were sunburned, not so much because we were left on the reef but because we didn't take enough precautions in the boat. It'll take a couple of days to subside but we aren't really burned.

We took the inside passage back, following a marked channel that zig-zags through coral heads and into channels. It's faster, I think, than going outside, and very beautiful as one skims over the greenish flats suspended by crystal water.

Well, what, in summary do I think about the Moorea Lab and what we might do there? The environment is lush and rich with opportunity for good students. I could do much there with my animals, from the first studies ever on pygmy sperm whales, to, probably, a longitudinal study of spinner dolphins. The reef has almost endless possibility and would allow our students to broaden their horizons a great deal. This place is in the mother fauna of the tropical world, and it needs to be experienced in fine detail to be appreciated.

But there are problems. First, it is fairly far away. But costs of transportation are only modestly more than say, working on an outer Hawaiian island. Second, it is French and largely French-speaking. It would be good for students to face that. Third, it is in "paradise" and we will be told over and over we are on vacation, when, actually we are at work. I recommend ignoring this largely, but attempting to show the intent to do serious work in various ways, such as production of science.

Fourth, the station plans are embryonic and the situation at Berkeley is stand-offish at best. George Barlow has soiled his nest with Mr. Gump and is no longer effective as interface. Whether there is a replacement I don't know.

Fifth, in talking to Luci and Nui I find a rather dim view of what they face in operating such a station. No one seems to know how maintenance costs, or operational costs are to be handled, who pays and how much. They seem to think a Tahitian gift of support will run things. These items must be clarified or no campus of UC can afford to get too involved.

Sixth, the role of Mr. Gump needs to be clear. If he is in charge he needs to define this charge and to tell the University what its degrees of freedom are, and what its responsibilities are.

It could be good, it could be a can of worms. If good, we could benefit, if not, we shouldn't touch it. For us to take part, I think something like the Panley Fund should be

set up. This fund, though small, provides on a competitive basis, modest support for UC students wanting to work in Hawaii.

An ability to use this area, whether Tahiti, Moorea, or Bora Bora, will be modest though it could be sustained. I'd guess if we could field 4-6 student projects, two longer [?] staff projects, in a year we would be close to our normal potential at present. We shouldn't subvert most work at home for work here. If transportation and some subsistence for such a level could be placed in a competitive fund and operated by an academic committee a total amount of about \$15,000 per year would suffice. Larger group projects might utilize University Expeditions as a source, or regular grants.

To make this a real and continuing CCMS I see this support as a necessity.

Our trip across on the ferry was uneventful and dolphin-free, though I kept a good watch. I'd guess two hours in my recording vessel would make the trip.

We cabbied it up to the hotel where, as before, we were greeted most graciously and treated like visiting royalty. Scientists are scarcely used to such treatment and it could go to our heads.

Ed Fearon and Mike Wilson greeted us and saw to it that we had front row at the show. Tahitian hulas are pretty honest fare, I've always thought, though I guess the old, totally uncovered version was even more honest than our present one. Done by truly beautiful women and who can say nay.

September 6, 1983

Hotel Bora Bora, Bora Bora

We packed and were on Air Polynesia at 10 AM and off across the open sea to these tiny bits of land, as noted before, only a few minutes out of Papeete I looked down upon a school of sperm whales straggling along a drift line. Now that would be something—a place to work with sperm whales.

We flew over flat Huahine and then later Raiatea, and shortly Bora Bora, to land on a motu at the edge of the broad lagoon.

We piled in a launch, crossed the lagoon and were picked up by two "Le Trucks," who ferried us to Hotel Bora Bora. Now I know what Mr. Joe meant. The hotel is a cluster of individual thatched houses around a central diving and check-in area and office building and is wonderfully tastefully done. The houses are trim, wood, windows, screens, and thatch. A tray of fruit and two bottles of wine greeted us. Out front palms arched over the immaculate strand and beyond to flickering turquoise and deep blue. Frigate birds hovered overhead and a sea breeze fluttered the leaves. Further beyond white waves leaped along the fringing reef and cumulus drifted like white ships.

If ever there was a recreation of the dream of tropical paradise, this was it. The staff mirrored it all, friendly and graceful and capable, too.

We were greeted by Monty Brown, the manager, and he is arranging a boat for us tomorrow to look at reefs and the passes. Monty is an affable Kaamaina boy from Kona.

John and Vicki and I felt our circumnavigation of Moorea had been such a successful way of getting our bearings that we decided to do it again. We rented one of those pressed metal Citroens, powered by a lawn-mower motor, or near equivalent, and started off, first mastering the mysterious shifting mechanism—a lever on the dash. Bora Bora is much lower and drier than Moorea, but some monolithic peaks rise in vertical cliffs to produce spectacular scenery. The lagoon is broader than that at Moorea, has a

single very large and very deep pass leading into a giant deep water lagoon, which as some one said, and they were wrong, “could anchor all the Navies of the Pacific.”

There are a few mountainous islands (motus) out in the lagoon, but mostly a very long motu of sand clothed densely with coconut palms, borders the outer lagoon—or sometimes just a reef at sea level.

Vast areas of the lagoon are shallow too, with white coral sand just a few feet down, making the water white as milk apparently. [Note on side of page—“Trash, not just from storms, but old rusting ?? and just plain junk, and it is being hacked at by development in various places. It is, I think, seriously threatened as a “tropical paradise” by these things.”]

Bora Bora seems more remote, more oceanic too, than Tahitia or Moorea—brown man of war birds hover and dip, brown boobies and noddy terns swoop and call over the palms at night and shearwaters call their plaintive cries.

Our trip took us on the only road, about an hour’s trip to go around. Most is on the flat just above sea level and most is a coconut grove with wet land pockmarked with land crab burrows. We watched one retrieve a big leaf from the center of the road, haul it to his burrow only to have a furtive claw rise up out of a neighboring burrow to clip away at it.

Up towards the airport our car simply quit. Two gals stopped to see how we were doing and so we pushed it to the side of the road and hitched a ride. Finally we found a phone, after two failures and were soon picked up by Fernando?/Antonio? who entertained us with stories about Vaitapu and a local Tahitian who wanted to build a ship restaurant but who instead sank the ship spectacularly in the bay and then got another, also in the bay.

A fine dinner and to bed. Tomorrow Richard takes us out to the pass in the morning to look for dolphins and to dive. I forgot to mention we saw a *Manta* and some *Mobulus* leaping and cartwheeling out by the airport.

September 7, 1983

Hotel Bora Bora, Bora Bora

After a fine sleep with the wind fluttering the thatch and whistling about the eaves—our houses are right on the beach, facing windward—and the little surf spilling against the beach, we arose at 7 AM.

Monty had told us something of the dolphins here and he seems to know them. He said there were none that habitually used the pass and that he had rather seldom seen them outside. He mentioned seeing *Tursiops*, *Steno*, and pilot whales (he used latin names), and told us of once seeing two whales encrusted with barnacles lying on their sides outside the pass. These must have been humpbacks.

Frank, an affable and competent Algerian Frenchman took us out in a Boston whaler. We cruised out the deep channel and turned south to a point where the wind began to pick up a considerable chop. We could see the atoll of Tubai on the horizon and Mapiti, rising high to the northwest. Frank and Monty both reported that dolphins frequented the passes on Raiatea and agreed that they were not here. They weren’t this time. But I’ve learned I must check. I once had a hotel operator tell me there were no dolphins in his lagoon and in fact they went by his place nearly every day. But these guys knew better and were right.

Lubai, Frank told us, is owned by a French lawyer and operated for copra and that many Bora Borans go there to fish, especially for turtles, which are becoming rarer at Bora Bora. He says the locals have no idea of conservation and don't understand saving young fish or protecting certain areas. They have partly resisted the idea of protecting the reefs in front of the hotel. We will inspect these thoroughly tomorrow.

Frank took us back inside the reef and around a high motu and right back of the barrier reef. There we threw the anchor out onto a coral head and stepped ashore onto the tiered reef platform itself. It is a nearly level coral platform about 50 m wide with oceanic combers crashing on the outer side and a flood of water usually flowing inward. Sometimes it subsides and everything is exposed and sometimes it's waist deep with white foaming seawater. The rising waves are blue and translucent before they crash all at once in foam. One has to brace oneself strongly to keep from being tumbled by them. Vicki fell once but was not badly scratched.

The platform varies and new organisms seem to come in near the wave break and one can see fissures running deep into the sea from the outer platform margins.

The platform is pockmarked with crevices and holes and little depressions. In these one can see organisms such as sea cucumbers lying. John was surprised at the dearth of urchins in these places. We jumped with shoulder-deep water back of the platform. Oceanic, clear and refreshed by the constant inward flow, this is what refreshes the lagoon and comes to flow out the pass. In view of the influx we encountered, exchange of the entire lagoon should be calculable, and my very offhand guess is that it might be frequent.

Our first dip in and we were surrounded by butterfly fish—a lovely one with a yellow back and tail, a black tail spot and two vertical dusky bars. It's not Hawaiian, so I don't know it. Other fish swirled about—brilliant parrot fish, tangs, wrasses, the black triggerfish was common, the *B. rectangularis* less so. Cleaner wrasses stood on station near boulders waiting for clientele to come in to have their parasites picked.

I looked up and noticed a black-tipped shark and then another, each a bit over six ft. and very well-fed looking. Their pattern except for the black fin tips looks not unlike a spinner dolphin.

They circled us, never coming closer than about 10 ft. and never seemed to be more than curious. It turned out they are fed here by the staff of another hotel whose divers do it underwater. They are indeed well fed, and apparently pretty tame and not at all feared, though I admit to being uncomfortable that they might be behind me. Frank says as many as 20 may come in. That, he says, is also why we were constantly surrounded by clouds of curious butterflies and tangs.

The corals here are as colorful and diverse as any I have seen. A blue encrusting form (*Montipora*) sets the dominant theme, followed by mawls, patches of red encrusting organisms, somber browns and lighter yellow. So near the flooding platform, sand is sparse and only in pockets but dead coral is littered about, doubtless being ground to sand and washed inward. A brilliant plush green alga was common. The most striking inhabitant, other than the very diverse and colorful fish, are *Tridacna* clams. Their zig-zag mantles were exposed everywhere, often several on a small coral head, or even bored into the rocky pavement of the reef. Only the mantle and shell tips showing. Most are eight in. wide or less. They are jewels. The only similitude that strikes me is fire opal—

bands of most brilliant iridescent blue or blue green, or tan, shining on the coral heads or reef bottom.

The water was clear as glass. At its surface was usually a contingent of ghostly half beaks or needlefish. They swam at the silvery interface and I watched as they moved up into wavelets and down into valleys between them. I'd love to experiment with the signal systems that let them school.

The Pearses uncovered all sorts of invertebrates, various urchins, cucumbers under overturned coral boulders, and a number of molluscs. *Trochus* shell was very common. It was introduced here in the 1950s. Considering that the animal is good to eat and the shell valuable (it's made into jewelry, buttons, or simply polished whole), the reef is not that overfished yet. *Tridacnas* good to eat too, and I saw hundreds.

Back at the Hotel I talked to Monty about his needs for a reserve, about the opinions of the local people. He told me of a great die-off on the outer reef some years ago in which sea level seemed to have lowered enough to leave much platform exposed. He said the stench was awful and the kill spread inland as water washed rotted material into inner waters.

It's hard to see how such a sea level change could happen and then reverse itself, but I guess it did.

Late in the afternoon I walked down the beach, thinking out this and that. Schools of mullet flickered in the shallows and I tried to see how they signalled each other. I think they must always have another in lateral view or they must play catch up. If only fins and tails are in view they race after their schoolmates. Size is not important, nor is position in the school (ahead, behind). I saw Radakov waves when they were disturbed—a wave of influence moving at something less than the speed of sound swept through the schools when I tossed pebbles into the water.

On Moorea there is a blue-tailed skink. Here it is copper or brown. I think this is the skink that is all over Polynesia. It seems to frequent coconut debris and to creep into wooden boats. These scuttled among downed coconut fronds, or sunned on coral rocks.

I've seen only one gecko here. A sleepy eyed Frenchman, far gone from martinis, had him on the bar and called him Charles. Charles was a little sharp-snouted, black-eyed lizard with darts of black along his sides. He seemed not at all agitated to be held and the girls at the desk said more lived up behind the signs above the bar. I have no idea what form it was except it looked like my memory of a hermaphroditic species.

John returned from swimming the reef in front of the hotel and says it's in bad shape—much dead coral, but many fish.

Tomorrow, we dive it again and look at it with the glass-bottom boat.

This is a languid place for the visitor. The days flow by, taken up by little things. For the staff it's probably much different. Monty has a severe water shortage on his hands. His reverse osmosis freshwater unit needs cleaning but he needs two days with no visitors to do it. We're probably 60-70% full now (visitors) and it has been over 95%. I'm told no one can rely on Vaitape to develop a decent water system. It's got to come. A solar-powered one would be a natural for this place, if economics warrant, or even just an adequate catchment system such as they use in Bermuda.

Vicki had gone out on the "sunset cruise" and she didn't return and didn't return. Then, in the dusk I saw her walking quickly up the walk to her bungalow. Even in the dark I could sense her anxiousness. I walked over and she had been in a ship wreck of the

catamaran. Someone had changed the buoys and the skipper had a new crew and they hit a coral head. Most people were sitting down but standing ones included Vicki were tossed onto the deck. She was OK but was red with scratches on her hands, arms, and fingers. Her glasses were broken but had not gone overboard. She's OK, though, just bruised and sore.

Dinner, papers, and then to sleep. The wind whistles outside and the noddly terns still creak overhead.

September 8, 1983

Hotel Bora Bora, Bora Bora

This morning we took the glassbottom boat out to get some idea of the distribution of the disrupted coral reef, and we swam some of it later with snorkel and face plate. In the boat we could see that on the Raiatea-side of the hotel (SW) there was much dead coral inshore especially. It was represented by piles of white and gray staghorn and broke piles of dish corals. In amongst these slag heaps of pieces, some new corals were establishing but were small and mostly older *Porites* or new blue coral and carpets of algae, much of it *Turkmania* near shore and a lower form out deeper.

Around the corner in front of the hotel where the water deepens there is less destruction and around in the lee, by the dock, not only do species change but there is rather little evidence of damage.

Offshore, even in shallow water, destruction is not nearly so noticeable, most is alive and diversity is great. Two outfalls go into the area of destruction and one is on the property line in the lee, in an area of low biotic diversity.

The effect we see could thus be old and not yet regenerated. It could be caused or enhanced or unaffected at all by the outfalls. It is quite local. Swimmers from the hotel can reach nice reefs by the dock off the west end, or out 100 m from the SW beach. And by glassbottom boat fine reefs are easily accessible.

As for the reserve idea, as a need specifically of the hotel, it would be nice to protect the reef nearest the hotel, but it will be hard to sell the idea that special things are there to protect in the biota. Most is better represented out a little. Therefore I think it's likely to be a rough row to hoe with officials, even if we develop a well-documented faunal and floral list. A direct appeal on behalf of this and other hotels might have more chance of surviving inspection.

I do think poisoning regimes ashore, and outfall policy and content should be looked at carefully to make sure they are not causal. John says dead coral and live coral can be aged by rings. That might pinpoint when the kill took place. And I think current regimes around the hotel should be known. There was a strong set from SW to North as we swam this afternoon. I could not, ultimately, buck it and had to come in. The trades are up and whistling.

We're beginning to get a feel for the Hotel's problem. The reef is largely dead near offshore of SW the hotel. It is covered with a mat of algae mostly, but fish are very abundant. It hasn't recovered in six years of time since the die-off. There is talk of a channel being dug for the movie "Hurricane" that is said to have changed current

patterns. Sand is said to be excavated from the beaches around the hotel and to be replaced artificially.

We noted three outfall pipes from the hotel. One from the kitchen, goes out not far from our cottages. Another returns concentrate from the desalinization plant, at about 50 ppt of salts we figure as opposed to 31-33 for normal seawater. The other pipes go out on the other side of the Hotel. On our side there is no ready access to deep channels and the kitchen pipe must end in 10-15 ft. or so, maybe a bit more.

What is being added by these sources and by the poisoning they do for crabs and rats?

Kitchen cleaners, food wastes, pesticides, fertilizers that might cause overgrowth of plankton or just feed fish, or are coral polyps simply clogged somehow?

The waste from desalinization is not now very large. 44,000 liters of water are produced a day. For three produced, seven are returned in concentrated fashion.

The reef should have recovered more than it has in the time since the kill, it seems. The heavy fish population suggests feeding is going on, probably from the kitchen outfall. Fish are notably more tolerant of pollution than invertebrates and these corals probably require the purest of water. Even parts per billion of some chemicals can kill them while fish can tolerate many changes in the parts per thousand range.

The notion that the channel has cut off flow is opposed by the removal of sand by the current [?] ... need to replace the beaches, which suggests fairly strong flow. That one is, as yet, imponderable.

They need to know about current regimes around the hotel area.

We need to understand the other outfalls and the relation of outfalls to dead coral and algal mats. Maybe our glassbottom boat trip at 10:30 will help.

We begin to see the fragility of Bora Bora. There is a quiet lilt and grace to the people. They are "laid back" as the Santa Cruzans would say but that makes them vulnerable. The major vulnerability I see is social. Water can be solved, pollution can be controlled, but social destruction can be a permanent blot that could embitter these childlike folks. The plans, underway, I understand, for a Hyatt Hotel of 250 rooms violate all this and those who control Bora Bora are not strong enough, or do not care enough to protect her.

Surely such a hotel will have to import work force, instead of, as here, using local families and giving them good lifetime jobs. Surely the rift between native and visitor will grow as it has grown on Hawaii until it simmers, ugly and threatening, just below the surface, ruining the very thing visitors seek.

It can trivialize lives and tear up values and probably erode the tourist business too. One hopes for better.

Surely the new hotel will compete with this one and some graciousness will suffer at each.

September 9, 1983

Bora Bora, French Polynesia

During the night I could feel unwonted things going on in my stomach and other lower parts. Soon enough it hit in full force and cleaned me out. With medication, which I carry on these trips, I stabilized things and wanted nothing more than sleep. I cancelled out on the day's snorkel with Frank, sending John and Vicki out to explore the lee reefs

of the island. Poor Vicki, aside from several abrasions and cuts, is stiff in the arms and has trouble using the fingers of one hand to pull on fins, tie laces, and the like, but she bravely went off anyway.

I just slept, read a little, and slept some more. By lunch time I could join John and Vicki and hear their stories of the dive (lovely staghorn corals). Then toward 16:00 our bags were taken up to "Le Truck" and we sauntered up. Monty came out and we discussed the coral problem. Mr. Joe had apparently called down to the Tahara'a saying if we wanted to visit authorities it could be arranged. Neither John nor I can stay over as suggested. School presses, students need our cosmic advice, classes have to be organized, and so forth, and we are scheduled already for the day after we return.

Monty had looked into the matter of chemicals used in the kitchen drain. There is something they use now and then that dissolves all organic matter. But the more I think about that, the more I doubt such a problem. The current set seems always toward the deep entrance channel and much of the kill of coral is upstream from the drain. I rather think sand dredging, either by the Hotel or from construction upstream is a possible cause and/or wave action from storms. The coral behind the fringing platform on the outer reef is not badly damaged but that on a windward beach along the hotel is. This could be due to the fetch from reef to shore, in which big waves could build up. Big waves reach deep and could tear off the dish or platform corals and snap the delicate staghorns, which make up most of the dead coral. The heavy *Porites* obviously weathered the storm. Now it would have been killed by siltation too—so storm damage seems most likely.

In the lee of the hotel the coral, while different, is pretty well intact. But was, what is now a lee, a lee in the storms? The dead coral looks years old. When did they have storms here? The hurricane (or cyclone as they call it here) was only last year, and then not before back to 1906.

Corals are reestablishing. The *Montipora* (the blue encrusting coral) is well represented. The plumose alga, *Turbinaria*, is, it seems to me a successional plant and it is in a fringe along the shallow water.

The water dynamics of atolls come clear to me now. The fringing reef acts as a bathtub. Over its rim waves crash sending sheet after sheet of water into the lagoon. The sea level inside rises a matter of inches higher than outside. Water then escapes through the passes and circulation patterns inside are determined by how the water flows for escape.

In Bora Bora, only a single pass exists and all flow patterns therefore relate to it. The Hotel Bora Bora sits at the head of the deep water channel to the pass and water sluices into it from far up lagoon. Monty says only when it is very calm does the current nearly stop but that in his experience, it doesn't reverse. It shouldn't.

Well, today we talk to Mike the hotel manager, about Mr. Joe's wishes and then will take a jaunt out to the Arboretum and the Gauguin Museum. These are at the neck of the island, which is made of two main volcanic centers, each thrusting up a mountain, with an isthmus in between. [Drawing]

Well Mike told me Mr. Joe had indeed called through and we arranged for a dinner tonight with Ed Fearon. We'll discuss the reef problem at Bora Bora then.

Vicki, John, and I rented a Peugeot lawn-mower motor-driven car and sped off eastward toward the isthmus of the island. It was some drive. The nearer the isthmus we got the more blasted the landscape became. It looked like the full brunt of the April

hurricane hit there. Houses were blown apart, especially roofs were removed, and near the water everything sometimes went. Windrows of palms were down, many now cut into lengths. Tangled piles of trees lay on the beach, or in the mouths of streams. Some lay where they fell. Many exposed trees such as huge old kamanis were tattered where limbs had been twisted and wrenched off.

Incongruously, windows in some newer buildings were intact, and even a little way off the beach things weren't so bad. At the isthmus we stopped for lunch in a half-boarded-up restaurant. The food was good and it seemed "business as usual".

Once over the isthmus the evidence of hurricane was almost absent. The flora became verdant and varied. Not far down this road we came to the Paul Gauguin Museum. It is a very well-done chronicle of this strange life displayed as a series of open pavilions. It traced him from his childhood in France through an early successful business and marriage through his renouncement and wanderings through Polynesia. I like his art, its bright blocky colors, its capturing of Polynesia, but this mysticism is his own.

Next door we visited the Arboretum before going on down the windward coast. Aside from some beautiful flowers, two things struck me—one a giant Indian banyan tree with aerial roots as large as most trees and the second, a wonderful grove of tropical chestnut trees that have the most remarkable buttressed roots. Many of these are vertical fins of wood radiating sinuously from the main trunk, and most only an inch or two thick in most places.

The windward coast is verdant and riven with clear flowing mountain streams that pour from the highlands. Misty green valleys with fluted lava walls that seldom could be seen entire because of a cloak of clouds. Around the whole coastal shelf of Tahiti are houses and little plots of tropical fruits and ornamentals. Most people were Tahitians, outside Papeete.

Papeete itself is a prosperous tropical place—no third-world poverty was very evident though many live in thin-walled houses of no great extent. One feels they like it that way. There are no really tall buildings, a small but nice harbor along a rather steep coast, and there without a fringing reef.

Back at the hotel we had dinner with Ed Fearon. He's a nice, open guy of about my own vintage. I thought he seemed a bit beaten down by some of his problems and the difficulty of getting past a demonstration to do needed things. He felt the Mayor system slowed progress because unskilled people were trying to do things like keep water systems going. He felt as we did that it was probably best for us to live[?] up the support of Dr. Bernard Salvat, Director of the Moorea Station, before making an official presentation to the Authorities. John and I are still trying to digest our findings and trying to prepare a set of recommendations. Salvat has headed major worldwide efforts at Coral Reef conservation, and since he is French, and important locally, we feel if we, as Americans, can bring him in, we might actually inject some ideas into matters such as the degradation of Bora Bora.

The Protection of Coral Reefs From Human Damage

Coral atolls and reefs are amongst the most beautiful and interesting marine habitats in the world, and their attraction has begun to lure more and more tourists to them. They are also incalculably diverse and scientifically interesting systems.

Together these things have caused protective measures to be proposed and in some cases implemented for some reefs. Two sorts of protection plans have been suggested: 1) for large samples of reef unoccupied by humans, and 2) for reefs already used by native peoples and tourists.

Our comments concern the latter and result from a modest survey of only two such reef systems. One at Moorea and the other at Bora Bora, French Polynesia. Our work was a first reconnaissance done at the request of the operators of two hotels in the area.

We present these ideas as grist for discussion in the hope that they might contribute to the long-term conservation of these systems and the people they support, both indigenous, and the operators of tourist installations and the tourists themselves. Our ideas are probably not new, but they do represent the considered views of three marine scientists, two invertebrate zoologists, and one marine mammalogist-ichthyologist.

The coral reef systems of a well-developed atoll system cannot survive in dirty water, so maintenance of water quality is the important . . .

There are two parts to this: 1) First, most reef corals require sunlight because much or even most of their nutrition may come from indwelling plants called zooxanthellae. The microscopic plants produce food by photosynthesis which both organisms use. This means that most reef corals grow only in shallow clear waters that allow penetration of the very specific colors of light used in photosynthesis and 2) many reef invertebrates, including corals, are very sensitive to being clogged and killed by siltation. Thus sediment size, load, and kind may be critical to reef health.

While reef fish are much less affected in the short term by all of these things, they depend ultimately on reef productivity and will fade as the reef fades. So the crucial items for planning for the health of atoll organisms are 1) to know the water budget of the lagoon through time—how fast is the lagoon refreshed, and how does this refreshment vary; 2) to know the depth patterns (bathymetry) throughout the atoll; and 3) to know in some detail the current regimes of the major parts of the atoll lagoon; 4) to know the general distribution of the organisms which are major components of the reef system; 5) oxygen tensions at selected points during these tides; and 6) water clarity profiles.

Much of this information is not especially difficult to obtain. It requires an opportunity to sample some features at varying times throughout the year and it requires straightforward surveys of others. Considerable existing data probably already exists.

Once such a baseline is in place, much less complete measurements will allow measurement and assessment of annual changes.

The following scheduled monitoring will allow good correlation with baseline data.

- 1) wind direction and speed (daily record)
- 2) wave height outside lagoon
- 3) current velocity at passes (24-hr. record each two weeks)
- 4) water clarity
- 5) tide height

To do part of the monitoring standard weather sheeters including recording thermometer (sea, air), anemometer and rain gauge should be established at appropriate points on windward and leeward shores. Other measurements can be taken by a

technician at regular times. These baselines themselves will allow local planners to assess many potential impacts on the reef. For instance, by knowing current velocities at a given location, and knowing expected seasonal fluctuation, a planner could easily pick out the time of least impact, and could assess downstream effects on other installations. (High currents will insure rapid flushing of any sediments and thus a quick return to good water quality. Low water temperatures are also likely to be safer than high temperature periods when animals may be close to physiological limits.) For example a new dredging project could be assessed in terms of its effect on existing facilities.

The monitoring will allow correlation with the effects measured in baseline tests. If, for example, wind velocity is low at a given time, a planner might know that lagoon refreshment rate would also be low and thus an especially dangerous time for dredging.

Physical Damage to Reef Organisms

While natural processes do damage reefs, these are usually in balance over time. But, when human impacts are added, a reef may degrade rapidly. Such impacts we are familiar with are 1) construction damage, 2) anchoring of ships, which tends to uproot or crush delicate corals, 3) swimmer impact, which can break dish corals or staghorn corals especially, 4) coral collection, both commercial and amateur collectors, 5) fishing, especially for embedded organisms such as *Tridacna* clams. Effects are yet to be severe immediately adjacent to tourist facilities, where swimmers are common, boats frequently anchor, and where pollution from other activities by the facility may disrupt the biota.

It is suggested that, in view of the special and growing importance of tourism in French Polynesia, a special effort be made to assure pristine reef conditions near shoreline hotels, where the reef is a major attraction. This might take the form of establishing a protection zone to 200 m offshore of all such facilities and 100 m along the shore on either side of their boundaries. Rules for such zones might include 1) control of all outfalls so that no poisonous chemicals, or tertiary tainted wastes, be allowed to enter the zone, 2) a particulate matter standard be met, by any activity within the zone and that for particulate matter oxygenation outside the zone special precautions be insisted upon to assure that this standard be met in all indicated protection zones, 3) that no fishing (either with hooks and lines or spears), shell, or coral collecting be allowed in these zones, and 4) that all boat docking or beaching be done only at designated sites except for craft of such shallow-draft (canoes) as to be unlikely to cause damage to reef organisms.

The Sociology of Change and Reef Degradation

No matter how careful people may be, heavy use can degrade a reef system. At Bora Bora we saw much change only a few months ahead as two major new hotels are planned. At present most of the work force is composed of Bora Borans, who have some degree of pride for their island home. This crucial element will be less with an imported work force.

Atolls are very finite things in terms of space and the impact they can stand. The practice of importing labor and of building new housing to support them can be expected to impact the atoll, to reduce the quality of fishing and of such things as shell collection.

Construction in the Lagoon

Any work that changes flow patterns of water drainage can be expected to cause ecological disruption both up, and especially downstream. Any such work that increases turbidity, such as sand mining, could be serious. Any fill of terrestrial soil, or runoff of construction on shore may be serious indeed. Pristine water is the life of the lagoon, and the flow patterns it has established over time are a crucial part of its balance.

Outfalls

Standards should be established and monitored for the following items in effluents.

- 1) No non-degradable organochlorine pesticides or biocides.
- 2) [end]

March 1984	Baja California
April 1984	Granite Mts
April 1984	French Camp
May 1984	Matolle River
June 1984	White Mountains
April 1985	Kern River Gorge/Granite Mts./Mono Lake
July 1985	Wrangell Mts. National Park, Alaska
October 1985	Solano Co. "Humphrey" the Humpback Whale Rescue

March 17, 1984

Baja California Norte, Bahia Los Angeles

George Heinsohn and I made our way down to San Diego and thence to a charter flight to L.A. Bay via Tijuana where we passed customs perched in our airplane seats. Then off and along the west face of the Sierra Juarez and down near El Alamo and over the very spine of the Sierra San Pedro Martir. Right under the plane passed La Providencia, a rugged peak of granite fins sparsely clothed in trees. Behind we could see the lagunas of the main masif—La Grulla[?], etc. and off to the SW the dark canyon of Santo Domingo.

The Gulf was calm; the pathways of slicks wandering off from below us.

At L.A. Bay the runway is now paved and we were escorted to a motel (new), fed, and then wandered out to the bay and distant sand spit to watch the birds dive—brown boobies and terns and pelicans and gulls. A tight feeding flock of eared grebes dove in the shallows. I could see them drive fish, which dimpled the water ahead of them.

After dinner we wandered off to bed.

March 18, 1984

Puerto Don Juan, just outside Los Angeles Bay

The morning was spent up in the cirio forest above L.A. Bay. It was magnificent and in bloom. I found a zygophyll that looked for all the world like jojoba, but was in a wholly different family—that of *Larrea*. I scratched a *Bursera microphylla*—torchwood which bled sap like turpentine and much more.

Finally in the afternoon we boarded and made our way out to a nearby anchorage.

Bottlenose and common dolphin were seen near the bay entrance in separate schools.

March 19, 1984

Isla Partida Norte

The wind ruffles Canal Ballenas but nonetheless we spotted a whale—a Bryde's, I think—small, less than 40-45 ft. I'd guess, nondescript gray, modest fin, evasive. Just south of Isla Smith.

The channel was flecked with white caps and little short rollers, but we soon put her on the fantail as we went south along the buff and pink cliffs and battlements of Angel de la Guarda Island. We rounded the tip and as we doubled back up the east side we encountered a big bird flock and a common dolphin school in a feeding frenzy.

It was a melee, with boobies rocketing like arrows into the water in bunches. At the same time big pelicans heeled over and dove, only to bob up quickly. Light little Heermann's gulls fluttered down, picking at invisible motes in the water.

The dolphins nearly always circled the area where the plunge-feeding birds worked. Once the boat took us very close so that I could look down. I could see the greenish-white flashes of dolphin bellies down maybe 15 ft., darting about but roughly in a circle. Often the surfacing dolphins traveled in an arc around the falling, diving flock of birds. The dolphins obviously stayed deep enough to avoid the plunging boobies.

What seemed obvious was that the dolphins had forced up a school of fish and that birds were taking advantage of it. Once I saw fish no more than 3-5 in. long, and dark and scattered in the water, not in a tight school. The fish did not seem to dart and swim in unison as a tight fish school. Others reported fish [?] but I did not see them. I wonder if they could have been whole fish. I saw a dolphin chasing fish on a fairly swift, erratic course. The frenzy went on without abatement while we were there—maybe ½ an hour.

I felt that it was possible that the fish were disoriented. Their school seemed very diffuse and uncoordinated. The dolphins did circle below and may have corralled and maneuvered it. We could not tell. The dolphins did circle and there were deep animals and surface animals. The target school often moved with considerable speed.

Onshore at Isla Estanque on the east shore of Angel de la Guarda we were immediately greeted by two distraught peregrine falcons circling and screaming above a steep volcanic hill. Later their nest and two eggs was found up near the top of the hill. The eggs lay in a scrape without nest material. In spite of disturbance the birds returned to the nest as we left in the Humber rubber boats.

Dennis Conejo caught a giant female *Sauromalus hispidus*, which I talked about.

Then back to the ship, around Raza Island where it proved too windy to land and thence up to anchorage at Isla Partida. I could look up at those lava scree slides that formed the type locality of the fish bat *Pizonyx*[?]. Later we saw some. I gave an impromptu lecture on spinners, which was well received.

The visitors are an interesting group; several are functionaries of the International Nature Conservancy or World Wildlife Fund. I've appended a list. Others come from all over the country from Hawaii to North Carolina and Long Island.

The food is excellent, the staff professional and friendly, and the captain a real pro (Captain Hempstead). Sven Olof Limblad, the owner's son is aboard—a bright, affable, professional guy to whom I took an instant liking. And especially, great and good friend Bernardo Villa is with us. He gave a nice talk on Isla Raza, helpfully translated by Ernesto Barillo, the International Nature Conservancy director from Colombia.

To bed, sunburned and tired.

March 20, 1984

Isla San Pedro Martir

By the time I'd rolled out, the dining room was full. For some reason no clacking of coffee cups penetrated our door and I slept on. But I made it for french toast and sausage.

We cruised on calm seas down the east side of Las Animas and then San Lorenzo Island. This long, narrow island is lined with the sharply faceted spurs of a fault-bounded block. It looks hard to land on and climb, very barren.

The hanging valleys above those 75-100-ft. facets would be hard to reach. At the south end, out in the channel, we encountered a lone blue whale. Our skipper expertly put us on top of it and several times we had views of its spatulate snout, nostrils, broad, mottled back, and knockled[?] vertebral column, and occasionally its tiny fin, and once its flukes, which just skimmed beneath the surface on a dive. The group was delighted. Gary James, an Orange Coast naturalist, and I gave commentary. He is a fine lecturer—clear, accurate, and knowledgeable.

Later, out in the tide-rip-marked channel (Hempstead says up to 4 kts), we encountered two fin whales who put on a good show for us, as did some common dolphins. We headed south for San Pedro Martir Island, a smoky ship in the distance—the island farthest out in the Gulf and one with the highest plant endemism. It's a precipitous, cliffed, volcanic island a couple of miles long and more than 10 ft. high.

As we approached, swirling birds came into view. Brown and blue boobies, red-billed tropic birds, and flocks of gulls and pelicans swirled around the guano-splotched cliffs. The island had been a guano station and all over her cliffs were walls, platforms, and trails. I suspect much had to do with a place to store the collected guano. Where can one put a sack on a precipitous island like this?

At the island, after lunch, we entered the Humber inflatables for a snorkel in a sea lion cove. It was cold—60-61 degrees or so, but my two layers of shirts helped. The bottom was rich with algae, and fish swirled in and out among the fronds. I saw wrasses, angel fish, sergeant majors, rudderfish, and triggerfish. The sea lions, including an old male, kept their distance.

I dried off and soon was back on the inflatable for a tour of sea lion colonies and bird rookeries and then a hike ashore.

We landed on a rocky promontory and clambered up the blocky volcanic slope to a guano-collectors trail that lead over to a little flat where the walls of old collectors' shacks still stood. Fragments of tile showed that these had been houses, now only partial walls.

I searched for *Uta palmeri*, an endemic. It is a big, drab uta—grayish brown with a lighter gray belly. Its blue spots were evident but scattered equidistantly over its entire back. Its blotch was all but gone.

I couldn't noose one. They ignored me and focused attention wholly on the noose, which they resolutely refused over their heads. I could walk within a foot or so of them, but I could not noose them. Dennis caught two with his monofilament noose.

The people on this trip are a very diverse, talented, and interesting crew. The inventor of Rada (Daly[?] Vollum), a crew of interesting Conservancy and World Wildlife people and more. There is a grand lady named Isabelle who is 87 and who has brought her daughter and granddaughter along. She's great. Tomorrow. Isla San Marcos and Caleta Santa Maria near Tres Virgines.

Oh yes, a juvenile gray whale and maybe two patrolled this coast. The waters are dense with plankton because of the fertilizing effect of the bird rookeries above. The whale was about 25 ft. long and very white. I think it had plenty to eat because the waters

were dense with mysids. I suspect this may be a waystation, just as the Farallons, Vancouver, and the Queen Charlottes are.

March 21, 1984

At Sea South of San Marcos Island

We traveled south last night to the vicinity of Santa Rosalia and then went ashore at Caleta Santa Maria for a hike up a deep winding wash that ran toward the coves of Tres Virgines NW of Santa Rosalia.

Before we went ashore we maneuvered among some whales that I thought were blue whales. But our views were of silhouettes in the distance. So we abandoned them and made our landfall over a cobbly beach against volcanic hills.

I walked with Fritz and Jean Deinhardt and had a wonderful time talking to them. Fritz is head of the Epidemiology Dept. at the University of Munich and his wife a Ph.D. in a similar area at University College, Univ. of London. Both are urbane, witty, deeply knowledgeable, and broad in approach.

I asked about their work, which is now developing an infectious hepatitis vaccine. Fritz said it is the world's leading infectious disease and the cause of much liver cancer. His approach was at the level of gene splicing and switching and directed at third-world problems to make vaccines cheaply enough to reach such people.

As we walked we looked at the variegated cliffs, the immaculate palo blancos, the gray-green ironwoods, and the torchwood trees that sometimes choked the wash floor. I looked for *Peterosaurus* in the cliffs but saw only *Sceloporus magista*, *Uta*, *Callisaurus*, and *Urosaurus*. A cucurbit blocked the rocky hillsides with spreading mats of vines which bore little pitcher-shaped cucumbers and jojoba plants were common (*Simmondsia*).

A few birds flitted by and we watched the ardilla scamper up the hillside. One group found a considerable flock of bighorn sheep up the hillside but we saw none.

We wandered back down for lunch aboard and then steamed off toward San Marcos Island.

We were detoured by a considerable encounter with about four blue whales, including one large one, off Santa Rosalia. Our skipper very skillfully put us onto them, including one encounter about 30 m off the port beam. The intake of breaths could be heard, mingling with the blow of the whale.

On we went and made a 4 PM landfall at the NE corner of San Marcos Island where we landed for another walk in another even more densely vegetated canyon.

George is all over the landscape photographing and biologizing. I think he's having a stellar time.

Tomorrow we reach Danzante Island and have a barbecue ashore at Santa Catalina Island.

The weather was essentially flat calm today and the sky china blue without clouds.

I decorated one of the passengers (Elaine Simpson) into my "Environmental Revolution" with *Mentzelia* leaves stuck to her shoulders. She promptly fired me and ordered silk sheets for her cot on the *Sierra Maestra*. Such gratitude. I hope the revolution can succeed without me.

March 22, 1984

Santa Catalina Island

The night was spent steaming down to the Santa Catalina area. We slipped past Danzante—cliffed and castellated and thence onto Santa Catalina offshore. The *Pacific Northwest Explorer* put us into a cove at the south end where the boats went ashore with snorkelers, and we went ashore to hike the hills.

I went off with Bernardo and George, up the granite cobble beach, and up a spur of the island. The cardons are, it seems to me, remarkably green and almost obese here, and the barrel cactus are truly giants, many taller than a man and weighing tons.

I found one flipped over and rotting and was able to dip my hand into the pulp at its base and come up with a handful of watery pulp from which I could wring a brownish, smelly fluid in some amount. It wouldn't have been hard to obtain a quart or so, if you could stand to drink it. I was interested to see that various island life and found this source. Some black beetles, like coryxids, swam in the pulp, and the island land snail was found alive under such a fallen barrel cactus.

The uta—*Uta squamata*—an endemic, is beautiful. It has a brilliant greenish blue tail and after body and is spotted with blue. I was not able to catch one with my noose. Once again they were terribly noose-shy.

They were found mostly down in the arroyos up under the sprawling limbs of big-leaf elephant tree (*Bursera hindsiana*) or copal tree. These arroyos were floored with wandering washes of fine granite gravel and bordered with copal, cordon, and a large-podded legume (*Pithecellobium confine*)? (palo tierra), barrel cactus, palo verde, often intertwined with vines of a cucurbit that looks like a dwarf-leaved *Marah*.

One frequently finds the swollen roots of this vine partly above ground with vines coming out the top like a corona [drawing].

We had a nice barbecue on the beach—steaks, chicken, sangria, and fine guitar and singing from Tracy of the crew. She has a rich contralto and plays well.

After dinner a number of us hiked out with lanterns looking for the elusive rattleless rattlesnake. One had been seen on a day walk, a *C. ruber* relative.

Anyway, we scrambled up the wash. A couple of geckos came out (*Phyllodactylus bugastrolepis*—an endemic). At a glance they look just like other *Phyllodactylus* except maybe plumper. Then we peered at two scorpions and finally a nice specimen of *Hypsiglena torquata catalinae*. Then we scrambled back over the cobbles helping to clean up camp and thence made our way back to the ship. I was walking with Peggy Parr (nee Sullivan) who turns out to have been at UCLA when I was there and knows all my botanical pals (Carl Epling, Mildred Mathias) and Ray Cowles. We had a grand time. She is now married to a guy who doesn't much care about nature, so she goes off on trips while he stays in Colorado, or something like that.

Bernardo saw some bats and in general, at the age of 72, scrambled over the hills like a mountain goat. He's amazing.

During the night we traveled down the coast and made a landfall off La Paz very early. Well before noon we were tied up at the main pier and were off to La Estrella for a great feed of mariscos, fish, beans, shrimps, and much more, plus abundant beer or margaritas. Afterward we visited the very nice three-year-old Anthropological Museum where I tried to identify some of Ed Jauss's pictures that Sven had given to the museum.

Then George, Bernardo, and I walked back, shopping (unsuccessfully) for hats for George. His head's too big and he has too much hair to fit a Mexican hat.

On board we ate again (help!) and generally socialized and as dusk hit cast off for San Jose Island.

March 24, 1984

Enroute, Cabo San Lucas

At dawn we woke at anchor in Bahia Amortejada, Isla San Jose, and at 6:30 were out for the dawn patrol of the nearby mangrove swamp. I went with Sven Linblad as his resident naturalist. We entered on the outgoing tide over a rather shallow bar, and once inside, the channel deepened to 6-10 ft. or so in places and just about everywhere navigable in our rubber boats. (Humbers—a British make). There were at least three species of mangroves—red (predominant near the water), black, and white. There was a reasonably good display of birds—a pair of oyster catchers unconcernedly wandering a sandbar, willets, snowy egrets, a couple of black-crowned night herons, flocks of darting doves including white wints, a reddish egret, pelicans, and more.

Sven, who never seems to miss a bet for gentle adventure, took us quietly up a side channel. I was surprised with abundant fish life—cornetfish were common as were gerrids and snappers, mullets and rays. We even saw trigger fish amongst the prop roots and some larger fish that darted away.

I took two trips in, the last a bit wet as the breeze freshened and the tide dropped. But nobody got very wet. I was able to tell a few stories, mostly about mangroves, to the folks. I'm earning my keep since I had to give a lecture in the morning after breakfast. I just told them stories of natural history, adventures in Baja, and my discovery of *Phocoena sinus*, the Arva—[?] at the cape, and about catching gray whales. They seemed to like it.

Then in the afternoon we put ashore at a long white beach on Isla Espirito Santo. Bernardo and I spent a couple of hours looking for the black jackrabbit. Their sign was everywhere—pellets, forms[?], and gnawings at the ends of pitahaya branches.

And finally we saw one—a big, dark, blackish-brown fellow with rather short ears and not notably fleet of foot. He disappeared off in the copal scrub. We hiked up toward the interior mountains, first on sandy flats covered with shells, attesting to the force of storms that must occasionally force water ½ mile inland. As we climbed it grew rougher, rocks and gullies, and desert pavement. The rocks were a mix of volcanics, chalcedony, and maybe some limestone, granites, and metamorphics.

Cardons, palo fierro, and others were common. Down near the water was a mangle dulce—with little juicy red fruit.

Soon after coming aboard we hoisted anchor and headed for the Cerraloo Channel and darkness.

April 10, 1984
Granite Mountains

Learning to See in Nature

The main thing one must do to see is to trust nature to know the answers and not to take your own second guesses as fact.

Another way of saying it is: "nature is the authority" . . . She knows what's going on; you don't. So, it's as simple as that; ask her and trust her.

She'll not tell you all at once so you must ask over and over, usually in little bits, hemming in the point you are really after with little salients; paint a picture with questions, each more refined than the last, and between each, mull her answer and refine your next question.

One way is to ask a broad question at first and then dissect it finer and finer. Your eyes will open as these questions paint new aspects on the canvas. As a matter of fact, you almost can't help asking that broad question at first. You simply don't know enough at first to be specific.

Example: Frinigillid flight

You will correct your questions as nature lets out little aspects of her secrets to you, and your eyes and mind will open more and more.

Thus one iterates back and forth between one's ignorance and nature who knows it all.

A fatal error is to settle on a conception of yours as fact. That stops the process of seeing cold in its tracks and you see no more.

Nature is so intricate that this unfolding process can go on and on just as long as you want it to, and always before you is a vista of the unknown.

This is because nature is built by adaptive compromise between other organisms and the physical world, and every feature of the organism you are studying. Creatures are not built by engineering specifications to fit this or that design criterion. They are infinitely complex adaptive norms.

Example:

One stops when one is satisfied with one's level of understanding, not when nature has given her entire design to you.

We are preeminently creatures of words. We classify, divide things into boxes, put words on whole sweeps of phenomena, and then go off sure we understand. But nature is made both of continua going in all directions and into everything, mostly seamless and without end. And little units such as individuals are dealt with by nature as digital bits but in a statistical manner. Ten thousand individuals draw a curve.

The electronics engineer would say we are primarily digital and individuals, and nature is primarily analogic. It depends on how fine you slice it.

We, in one sense are digital from the myotomes of our muscles to the coded messages in our nerves, to the vertebrae in our backbones, to our words. We must divide the world into packets to understand it, and we build everything we know as if we used bricks. Yet, this process is only an approximation of reality.

It is an approximation between our need to classify and the flow of nature that we attempt to deal with when we try to see. So, we chop our questions ever finer, like a chef slicing garlic, and piece by piece we build up a simulacrum of reality.

Does this digitization even extend to our genes? There in the double helix lie specific commands to do specific things.

But, however hard we try, never, I think, should we sit back smug and satisfied and say that we know.

But, recognizing who we are, one of our most important means of understanding is words. Use them with as much care as you can muster, use them with all the precision you can, and know that each little packet of phenomena they embrace is just that—a class more or less true.

So we use journal pages and pens to see.

You will find, I think, that writing words on a page unfolds understanding in a way so deep within us we hardly know what has transpired.

And those questions, tests, will come so fast sometimes that you will hardly know what has happened either. One proposes, and checks with nature sometimes all in a single glance, and sometimes one waits for weeks for an answer. Often you must dig, contrive, and struggle to get an answer.

Much in nature is in proportions, in equilibria (especially), in speeds, in temperatures, in weights, in angles. One can often see better by putting numbers on things. And one can cast reality in words better with dimensions on what has been seen.

We can learn to make measures; even approximate ones when we are in the field. How long is your finger? your fist? your pace? Can you count seconds, and can you estimate 100 meters?

But much you cannot see, limited as you are by being a human. We live at human height, speed, time and our ability to understand fades as we deal with living things much bigger or smaller than we, or faster or slower than we.

I think of the ponderous avoidance reactions of mother-young pairs of whales; just at the edge of our comprehension, or the social behavior of starfishes—utterly opaque to us until speeded up by time-lapse photography, when starfish can be seen meeting each other, whirling, touching, and reacting to each other.

And I think of mouse courtship; happening so fast it blurs. Only slowed film can make it comprehensible.

I find I have developed an almost subliminal mistrust of machines that come between me and my animals. The unvarnished view, incomprehensible though it may be, of a real animal behaving free from bias induced by my presence, is what satisfies best.

Homogenates, preparations, telemetered or filtered data, thermometers, even, make me shift in my chair. I'm not sure I'm going to like it. But those gadgets can do so much that seduction is the only word for their allure.

Yet, when I've truly seen something a wild organism has done, even though I don't necessarily understand it, there, there I have my "Hook In Nature" . . . A trail has been opened that one may follow secure that some way, some time, nature will explain herself.

Having faith in nature I'm seldom let down. There I was, after all, one on one, me and nature, and she said it to me loud and clear.

there are lots of reasons for breaking contact with nature. Some are easy to deal with and some much harder to sidestep.

Our buns resting on angular granite crystals may destroy our will to look. Or we may simply become bored. That gap between what's interesting to a human and a lizard may be hardly bridgeable. After a few hours of watching lizard naps in the sun, watching a few desultory push-ups and occasional flicks of the tongue, we may rise, stretch, scratch, belch, and break off our conversation with nature.

So it is important to do what one can to forestall such ruptures. Be comfortable, sit in the shade, ward off the bugs, and stay dry.

And when you write choose your words well. Remember that nature has subjects and predicates and that language is most perfect when it does too. The shorthand of telegraphic sentences is clear evidence that the observer has not yet slowed down to "mountain time."

Achieving mountain time, slowing down from paces set by cities is a crucial step to take. We bring the imperatives of city lives to nature and are blinded until we shuck them off. You will find yourself fighting, getting bored, and then, at some miraculous point, you will go over the threshold of boredom and find yourself on mountain time, and happy to spend your day with a star flower or a cactus wren, on its own schedule and pace, you having come closer to fitting into the silent ticking of the mountain and all its life.

April 12, 1984
Granite Mountains

Learning to See: Subsequent Reflections

Arrogance builds blinders. It is, after all, an inward-looking attitude. It is almost by definition, an attitude that ignores other attitudes or states of being. There is scant meeting ground between an arrogant person and the doings of nature, especially when to gain understanding one must have much capability at discarding bad ideas, especially one's own. They are the questions that failed, and unless one lets go of them the unrolling story stops.

The pet idea held too long, in opposition to all tests, is dogma not science. And good natural history is preeminently science. In fact it is at the center of science.

But all this relates to how we come to know. The unravelling of nature's threads requires imaginative ideas, little tests, and much discarding of failed ideas or more often, their continued reshaping.

But beyond this are those troublesome "why" questions. Why does the bee dance, or the globe spin? The answers we construct to these sorts of questions spring from our evolving world views.

Such answers have changed throughout our human history, always shaped in the dimensions of the world at that specific time and place in our history.

A Pueblo tribe, living in apparently timeless patterns unchanged from generation to generation, and knowing only a world of sky, corn, and maize, the surrounding tribes, inner dreams, forests, and animals built a view of these things that gave rules, and spun out reasons for being and ways of behaving.

Implicit truths sprang from being essentially part of the process. Indian society ticked onward like the voice of a silent clock, just as the mountain does.

But in time it seemed to prove inadequate. It was inadequate when asked to deal with the jarring arrival of Europeans, but were they any better equipped except by numbers and the rapacity of their view?

Both antagonists had explained their world whether they could or not, and both encased their pronouncements in dogmas so rigid that to violate them was to risk excommunication from each society. In neither case did their throwing-away muscles include ideas in their world view.

I see people building their lives around such world views block-by-block, cant-by-cant, and soon even the discarding of patent misfits amongst the blocks is so destructive that they live with the world-view rather than changing it.

Some structure is better than no structure, when trying to decide how to live.

If such a world view supports our need for opportunities, sociality, provides tests and opportunities that show we are alike enough to trust, contain our sexuality, and lets us surrender our destiny to its interpreters, it is likely to succeed. If it entertains us, so much the better. But it does not have to be right in any larger sense.

It need include no more than was needed by the Israelites or the Pueblo dwellers, even now. It need not deal with "why" questions in any real way to work. It must, instead, work socially, and its constancy, predictability if you will, is a positive thing for its practitioners.

Not so natural history. It works by revolutions of various sizes from the discarding of a tiny little salient of a question to greater jolts that shake whole viewpoints. No wonder the leaders of this or that sect who have arrogantly assumed responsibility for the direction of their followers whose central tenet is to be believed, recognize it as the enemy.

Darwin, we recall, regarded himself as a natural historian. This gentle man seemed never to understand the calumny heaped on him as he so honestly sought true things.

We have scientific traditions now that make it easier, but in many places the battle lines remain drawn and tense, and those who work by dogma fight for it with ferocity born of having their very reasons for being threatened, threatened by simple iterations of tiny questions about nature and tiny tests to see where her vote falls. Silent, she watches this strange metaevolutionary human battle, one side concerned with the here and now business of living, and the other the larger understandings that begin to tell us what we must do to function as a part of nature. Closer and closer we come to understanding natural process and our place in it. At the same time, the dogmatists fight and there is no other word for it, fearing but not comprehending fully the rearguard action.

Will these two ways of understanding and dealing with the world come together in a coherent view? There is no room for dogma while we learn, I fear, and that will surely upset those who live by it.

Subtleties are missed by the dogmatists of religion. They fear materialism and godlessness, seeming to need the haven of leaders who tell the way, uninformed or not.

How can this be? I don't fear those things. I'm at peace with a godless world. I'm at peace not being led. I'm at peace knowing my rules are ecological. The religious dogmatists fear that theirs and my ethics should fragment into ruleless anarchy, if my

view wins. Far from it. My rules, I think, are better than theirs because they spring from a glimmering comprehension of how the world actually works. My little tentative questions, and those of my colleagues, have led us to paint in the broad outlines of the ticking of the mountainside, and everything it implies.

We needn't worry at all. How can we convince them? It's a first step, that's all. Beyond lies what we propose with our knowledge and whether we can propose anything useful that can square these two courses of human experience.

We grapple with our humanness—all the list of things that are partly supplied by past incomplete world views. Natural history speaks about all those things too. But when can we listen and ask more questions of nature and learn who our real preacher is, and under whose wing we should crawl?

Our ethics spring not from god but from our sociality and our ecology.

April 21, 1984
French Camp

Slowing Down to Mountain Time

Why should we care about the land? I think we are evolving into the view that “to know the land is to love the land.”

In this class we look at the wellsprings of our own caring for the natural world.

Knowing the land can take, and should take several forms, encapsulated under:

- the aesthetic immersion—the sounds, the wind, the . . .
- the unraveling analysis of learning to see her processes.

The mountain lies there, and yet already we know that on its slopes and in its canyons are intricate stories, each complex and unending.

What Are We Doing On This Mountain?

Taking the next *personal* step in seeing how nature works. It's not that you don't already know, but books and the hillside are vastly different. We're awaking the little kids in us. That sense of wonder is the basis of good science.

We took and tested the proposition that nature holds the answers, not us, and that if we can contrive in various ways to keep ourselves out of the equation as we ask her, we can see.

And by asking ever more refined questions, whole skeins of her doings can become apparent to us.

I mentioned pace to you. How perceiving whale avoidance or starfish sociality was too slow for humans to see easily.

Here on this mountain meadow we'll try the next step, having to do with our own pace.

The faster we move, it seems to me, the more we internalize our thoughts, and hence, since we come to deal with ourselves instead of nature, the less we see of the surrounding world.

- * Fast cars to Las Vegas (capsules)
- * A runner stressed to the limits is concerned with breathing, muscle fatigue.
- * “A fast talker knows no belly plants.”

So, today we do a niche hunt and test two new dimensions of seeing. First it will test our abilities to slow down *to mountain time*. We will have to cross *the threshold of boredom*. You'll spend all day with a single organism. For some of you, that may at first be difficult. All day with a grasshopper you say? Who is talking is your city self and city pace, which has scant time for the minute doings of grasshoppers. You'll have to get over that, let yourself slow down, lay down on the grass and get eyeball to eyeball with grasshoppers. Walk the hills finding where, precisely, they occur. Let you guess why.

As you slow, reflect that the hillside, each square meter in fact, has hundreds of stories, interlocking, different, full of things we do not now understand. You'll be threading your way through one such skein, while all around the mountain goes about its business, with only the wind and the rustle of leaves to remind you that anything at all is going on.

It's that almost silent intricacy that's so remarkable about these wild places.

Now, what you should do.

Two or three of you work together and pick a common organism: a flower, a tree, a beetle, a spider, a lizard, a fungus, and describe its ways of living, its niche. Use every means at your command to discover things about it. If it's a plant, get a common mature form with flowers and fruiting bodies. Key it out, starting with the family key. Use the key to learn its parts, its morphology. Where does it occur? What pollinates it and how? What are the physical conditions of its life? Only on North-facing, dry, rocky slopes? In deep shade? How do its flowers work? Leaves? Plant shape? Seeds? What relations with other plants? What is it like through time? What are its roots like? How does it deal with insects? Sun? Rain?

For animals: Harder because only some stages are apt to be around. How does it feed? Meet mates? Deal with energy needs? Communicate? Deal with predators? Where do you find it? Take a beetle and ask such things.

In the grassy meadow at Gamboa Homestead.

Grassblades lighted green by the mid-afternoon sun. The airy note of bee violins comes from all directions. The grassy swale dips down amid oaks, big-leaf maples, madrones, and a scattering of yellow pines at its edge.

This field once bent to the service of the homesteaders is now a home of bees, floating monarchs tipping this way and that, spilling the gentle air from their wings. Reddish-orange ladybirds fly purposefully a foot or two above the nodding grass tops. Lupine pagodas with green bud roofs and purple floors below thrust up amongst the grass. They draw most of the attention of the bees. Between two trees an unseen air column rushes, its path across the grass marked by waves of nodding green heads. They flash light and rise again as the wind passes.

The deep duff of pine needles laid criss-cross over old greyed cones and dehiscent branchlets, [?] and gray like old platy snakes. Too [?], I must sit on its springy surface and lean back against the rugose tree.

It's warm but I must trudge up through the field and the road above and thence back to the old cabin. My swinging feet leave a wake of footprints in the calf-high grass.

A bark of jigsaw puzzle pieces tan and gray, the bark of a grizzled old sycamore.

April 14, 1984

San Bernardino Co., Granite Mts.

The Granites have woven their spell again. Our fine group has responded to the giant fawn monoliths by feeling properly awed and small, and warm and safe clustered here in the cabin against their bases. The open vistas stretching across distant sloping land and jagged ridges have created freedom and aloneness the way a forest never can. We sweated in the warm days and were parched an hour before reaching precious water at Bruce's cabin, pointing clearly enough for us to our personal fragility, as well as that of the flies, butterflies, and birds that flew there too to drink. As the streams dry with the approach of summer, they leave a wake of dessicated algal matting on the gravel and fringed with tinder-dry *Mimulus*, whose roots lost touch with the cool underground flow. Probably they were not simply the ones who lost the statistical game of life—and slipped into death, but had completed their part in the cycle. Who knows. It pays for *Mimulus* to bet some of its substance on temporary places where survival is chancy.

Up in the cabin we 28 have somehow circumnavigated each other to eat, sing, write notes, tell stores, dance even, and to sleep with skunks and cacomistles pattering across the floor or slipping quicksilver-like over the rocks and bunks. There has been much joy and personal adventure in little things for everyone, and we teachers have ladeled out fare so rich no one could gather in more than a fraction of it. Or, I should say, the desert has done this.

I led little groups down to the washes and we hunkered down under junipers or up against sugar-crystally boulders to talk of seeing, and nature, and how one can only see by believing her. And then we looked—at bee hives, tent caterpillar nests, at water striders, and mosquito larvae.

Steve led similar groups through the vegetation, noting where the invisible pediment below the alluvium dropped away, leaving many plants unable to reach water and the flora suddenly simplifying. He told them of strategies for dealing with heat, conserving water, and for photosynthesizing halfway, to complete the process at night.

And then we encouraged our students to search for themselves and they've gone off in all directions to see the eagles or watch the spiders eat, or to pounce on a sunning gopher snake.

Peg Mathewson is a born naturalist who knows a great deal already and who is filled with verve and curiosity. Michael Levy says he's been involved with "interior living" all these years and is now ready to look outside. And Ed Smyth, a man of elegant language, taking it easy now after a trek nearly to Granite Peak with Steve—a long hot, hard hike, but rewarded with reaching Granite Mt. Plateau, where they found a pinon-juniper forest and two small springs running in winding little creeks amid grassy banks. Steve says either could support a spring box and my live-riders[?] cabin.

Caitlin Bean, Jenny Griffin, and Mary Cunningham, George Banuelos, Alan Harris, Michele Murillo are now my blood brothers. We were sauntering up the wash near White Fang when Mary glanced down and saw a perfect bird point on the alluvium. Everyone took it as a portent. I found some less perfect pieces, flaked from rhyolite. Mary's was jasper. Then Alan found a limpid greenish chert spear point so we had to scratch off scabs, dip fingers in each others blood and kiss the earth. I actually scratched

my arm with Mary's point much to the horror of some. And then George showed us a partially hidden rock back close to the cliff base all patterned with petroglyphs. Down in a cool crevice we looked up to see pictographs on the sloping roof above—patterns in hematite. Was it painted on? Perhaps mixed with cactus juice? Certainly it is not powdery, but well adhered to the rock. There is no hematite here. Where did it come from and in whose pouch? What could a chemihueve trade for it, do you suppose? Such a price would seem to make it more than a casual act to paint these simple little pictures.

We crawled up in a cool crevice wholly inside one boulder—cool rock-temperature air, and crystalline granite gravel under one's boots. Caitlin, irrepressible Caitlin, heard me say I'd seen a rock that looked like a snail—"Dr. Doolittle's snail." She shouted and nothing would do, but that we should ride him for pictures, so up Jenny, Caitlin, and I went pulling at invisible reins and giving switches with the riding crop.

Steve had started the day off at dawn by going to Cottonwood Spring to watch the flowers of *Opuntia basilaris* open. His stories had been so intricate and wonderful that a repeat visit was set for this morning. We were up at first apricot light on the Van Winkels, and off over the bajada. By 7 we had located our plant, a group of seven or eight nearly spineless pads margined with flowers, undeveloped ones, four ready to open today and several that had gone by. The flowers last only a day, but it is enough. It is, in fact, a bee festival, with bees circling impatiently for the flowers to open and sleepy ones poking their heads out of yesterday's flowers, where they had spent the night.

There was much discussion of what sort of bedroom that must have been, the moonlight streaming in through interleaved magenta sheets, down among the china-red stamens and then when the sun came it must have become a warm, humid cocoon, getting ever hotter, driving the bee out like a camper from a sunstruck down bag.

The four buds about to open at first hardly looked the part. Their greenish sepals clasped the petals so tightly, little of their magenta could be seen. Gradually, gradually the sepals folded back, releasing the petals bit by bit. Still they could hardly be seen, but at the flower apex they revolved and unfolded until a crest of magenta could be seen—30 minutes since the sun first struck the flowers. Not long after, impatient bees began to circle—tiny trigonids, occasional solitary bees, a bigger grayish native bee, and Italian honey bees, the biggest of all. By 45 minutes the flower throat was all but open and bees probed at it. Our sleeping bees pushed up out of yesterday's flowers and zoomed away. Antennae first, then a head, and as the old withered petals wriggled they popped free, seeming to hurry inordinately to leave as if exit was somehow dangerous.

By then the rest of cream-colored anthers on vermillion filaments could be seen and a big, cream-colored capitate stigma and style.

Bees entered. Trigonids were everywhere, seeming to annoy the larger bees if they tried to share a flower, and one kind of big bee was all a flower seemed to hold.

The dusky native bees dove in, stopped for 4-5 seconds clasping the stigma, as if in some propitiation of the flower, and dove head first amidst the stamens to suck nectar from the flower base, their abdomens pulsating with the act. They emerged covered with luscious cream-colored pollen from head to tail, and flew away.

The Italian bees landed on the petals and walked in, avoiding the stigma and never feeding on nectar so far as I saw. Instead in a frenzy of plucking they gathered pollen, passed it to the middle legs where it was plastered to the abdomen and, as the bee left the flower, it hovered a few seconds, passing pollen to its hind legs where it was

plastered in a roundish lump on the midleg. It took only minutes before the bee was so laden it seemed to need to circle to gain altitude before streaking away. Very different these bees. Only the native bees seem to contact the stigma—coevolution, it seems, etched clearly in the behavior of the bees.

OK, I did want to mention the dune singing. Two days ago we piled in the bus for our annual visit to the Kelso Dunes. The morning was warm and still, and I worried for fear we would suffer from heat, and I worried about burning our feet should folks hike the mountain barefoot. It was calm and cooler than I expected at the dunes but my worries were still in order. People carried socks and it saved us as especially the magnetite covered sand became searing.

The dunes sang, people capered and flung off their clothes and slid and dove down the slopes in cascades of sand.

I listened at the top (though I slid, too), pressing my ear into the sand. Even though people slid 300 ft. away, the deep hum was very loud at the crest. It had traveled in the layers of the slip face, I think, piped upward to my ear. The sound came from the heart of the mountain loud, as if the entire mass was vibrating. Does the arrangement of layers contribute to the production of sound? Is its subtly layered form a part? Do platy minerals like magnetite, for example, line up and define the margins of these layers? If so, does that contribute? I dunno. Dunes with magnetite sing and beaches bark.

May 21, 1984

Matolle River Mouth, Humboldt County

Rules for Rivers and Watersheds

1. Water will move everything it can. The weight of each rock is a calibration of the strength of the river that bore it.
2. The river will spend its energy every minute, every second of its descent to the sea; it cannot store it once it is in the river's flow.
3. If it can't move it, it will go over or around it.
4. The mountain raised by the enormous forces of continental collision and the slowly churning interior of the earth provides the teeth of the river and adds this energy to it in the form of rocks whose weight gnaw at its own slopes all the way to the sea.
5. The elegant balance of the river's system, including the tiniest rills high against the crests, is only to be seen over time because rains come and go, and the hillside will store water energy in its duff and soil and in the plants that clothe it. In the end, though, it balances out, every part, perfectly.
6. Each rock or grain of sand has a number that describes precisely what force it takes to move it downstream, and when its number is reached, off it goes. The number is more than just its mass, or its density; it is also its shape, and the way the rock fell in relation to

the current and other rocks. If close to equilibrium it will flip and fall and fall again until it lodges and assumes a no[?] larger than the river can then move [??].

7. Narrow a river, or steepen her fall and she speeds; widen her or level her and she slows. Speeded she scours in a swift and powerful flow, roaring over boulders and scouring out pools, or she becomes quiet and peaceful and wide. So it is with the air as well.

8. Only a matter of scale separates things blown by the wind and those carried by water. Barchan dunes belong on sea bottoms and deserts.

9. A stream close to equilibrium, at peace with itself, will have its tributaries entering each other "at grade". A measure of responsiveness of each part of the watershed to the others. If they don't, some disruption has intervened. A forest removed, a part of the soil bared, a dam. But in time, the river will win and will return to inner peace.

10. In a river a simple geometry speaks of equilibrium, a complex one of various processes in effect approaching that same equilibrium.

11. Slow rivers wind and fast rivers straighten.

12. Banks and berms and flood plains are energy absorbers. Once the channel is full, the water flows over and out of the river and into still ponds, by the imponderable billions of pounds, each pound that much less to drive the river or claw at its banks and stream channels.

13. River engines murmur or rock, just as do gas engines. Volume not pitch calibrates power.

14. The corrosive grains and cobbles carried by a river heat as they clash, as do the currents as they themselves rub against one another, and 90% of what the river does is to warm itself from the icy cold of rain at the mountain rim to warmth before plunging again into the sea.

15. Life, land, and river are truly locked together as one.

June 6-8, 1984

Grandview Campground, White Mts.

The wind spirits of the White Mountains blast at my tent. Its thin nylon fabric slats against the metal poles, and on one side bends in, pressed by the gusty wind.

I arise, climb awkwardly out the door into the morning. I shake the folds out of my coat, which has been a folded pillow during the night. I walk eastward down a rocky defile to chase away sleep before breakfast.

Suddenly, over my shoulder, I sense a raven flying 30 ft. over the pinyon tops. I turn and watch it as it changes its undulating, loose-winged raven flight into an urgent circling drop onto a rocky outcrop below.

Its legs outstretched, talons spread, it wheels down in a magnificent coordinated arc. Its wings are cupped in tense downward curves, primaries spread and separate, fingers reaching out to grasp the air that slips between them. The raven's head thrusts downward toward the rocks, beak ever so slightly ajar.

In a glance I see the object of this maneuver—a black scaly lizard splayed on a sunlit rock shelf, half out of a crevice.

A flash of black, the lizard is gone, and then the raven stalks a few steps across the shingle, lifts into the wind, and slices away across the gray-green trees.

In some exquisite balance between the reaction times of a warming brain and the distance to safety, the lizard had gauged how far it could afford to emerge and it had, this time at least, won.

Who cares? Why should we have taken this long journey together through wild California to seek such vignettes. What might our time on the mountain have meant?

Well, for me, the things I have sought have been wonderfully realized. Again this spring interlude has been my springtime rejuvenation. It has been the tenth chapter of the most precious single thing in my professional teacher's life. I have learned and I have changed, along with you. Let me describe what I hoped for:

First, I wanted to unlock again our chance to wonder. It's so pure a thing in children and so tattered in us, or structured, altered, or even absent after passage through our educational system. Why is it that this passage so often wrings out and discards the very wellspring from which real seeing arises? Well, the needs of mass education are the culprit, leading to universities structured by committees and run by administrators who may seldom deal with the student capital they ostensibly serve. Education, while assignable to neat boxes, budgets, and flow charts becomes the giving and reception of predigested segments of human knowledge. There is scant space left for the individual spirit to meet with and ponder the world.

We are, whether we like it or not, an elite, the quite special intellects, chosen among many others from a University that is itself composed of an upper stratum of human endeavor. We should, if anyone can, see with clear eyes.

But as Steve and I know from past experience, when back in the Pleistocene we ventured on our first trip to the Granites, many of you would and did struggle to unlock your ability to wonder. What, you asked, would we do with a free day? Weren't you going to correct the English in the journals? And for heaven's sakes, how would you be tested, and judged?

Well, no, actually, we weren't intent on doing any of those things. We knew it was useless to set rules for wonder or to try to guess where it would lead.

Wonder, I knew, comes in parts. First there is the wordless absorption of a world; our sliding, circling, sluicing journey on the Matolle, for instance, was one example. No one will ever fool any of us now about many river things, even though we splashed and sunk each other and held fashion shows on the gravel bar.

Second, wonder can lead us into that analytical question and answer game with nature that we have learned to play. We pose the question, look, and nature affirms, denies, or more often waffles in incomplete acceptance. We dig deeper, focusing all the

past learning we can muster like a flashlight beam, on some tiny event like a cactus flower opening just after dawn, or my raven and its lost lizard.

Play, I think, and words, are handmaidens of wonder. Wonder flickers out like a fragile flame in the face of a structured professor-student hierarchy, or in the face of pride, or the internal troubles of tangled lives, or sickness.

Wonder is fostered, on the other hand, if we let ourselves shuck our pride of position, or age and all its trappings, and crawl on our hands and knees among the mosquito wrigglers. Play is an oblique reaffirmation that it's OK in this company to shuck clothes, or not, and crawl among those wrigglers.

And don't think that Steve and I alone have those trappings of age and position. You, too, are well on your way to crusting over with such veneers. They settle in like boiler scale, with nary a sound.

The second thing that I sought was the chance as an educator to step aside from my usual role as a purveyor of predigested facts and concepts to become, with Steve and Don, orchestrators of events. I wanted each diverse member of our group to feel the time was their own for personal discovery and reflection.

After all, what counts is your flash of insight, for a possible example—that the living and physical worlds are a single unit, we might call it “life-land”, or that flowers and bees are designed together. Jenny's personal discovery that *Mimulus* stigmas closed down on adhering pollen grains, or Monica's that the stigma of the same plant may [?] down to the retrorse hairs in the corolla tube to pick them up, can be an anchor for understanding, not only of that plant, but of the wider world, including human cities and societies, which after all, run by the same rules.

The rich trove of discovery that you, in aggregate, have uncovered is nothing short of remarkable. The personal electricity generated in the process flows through us all, and as we talk and question and fit the pieces together, we come closer and closer to being seers.

And third, I wanted very much to let the full play of our individual diversity hold sway in our adventure. Steve and Don and I could not, not ever, hope to provide what we could collectively give to each other. Besides that, such an attempt would be an enormous lot of work, and of course we would fail. Our “windows to the world” are too limited and we must see and be together.

So, for example, we wanted Roy to be the marvelous compassionate Roy, full of music and clear views about human aspiration that he is, or to have Gail and Peg share their wonderful insights into aboriginal life, or George his way with birds, or even the frisbee.

So many vignettes emerged—Sally's elegy to the blue bus, Diane's mordant description of Jeff covered with trappings, pockets bulging with stuff, advancing with wild originality, eyes seemingly on independent courses, or Jenny, the first to reach the salt, turning graceful silhouetted cartwheels as Ellen W. and I plodded painfully across the pointed sedges, or Ellen Van G quietly gulping the miles of this or that mountain, or Ed sharing his crystalline poems evoking the flash and flap of those steelhead at Big Creek, and then veering 180 degrees to give insightful and lucid reconstructions of the Geology of the White Mountains.

And finally, I hoped we would all ponder and seek linkages between the rules and events of pinyon jay and cushion plant lives and our own, and especially how we might understand and foster our love of the land and its life.

I think it is clear to most of you that seeing as we have performed it is no captive of science but a first step to things as diverse as philosophy, human relations, literature, and science. Each such intellectual direction, to be real and true, requires that we look and see clearly and speak true things. Science, I think, is only a curiously encoded version of this—a set of social rules that allow us to test incremental steps toward a larger but always incomplete truth. Science is a human process like those others are, and no more than they, relies on seeing as we have tried to do it.

Well, I'm at an end now, my hopes fulfilled. But beyond these things, for me as for many of you, this adventure has made me care deeply about you, my wonderful and diverse new friends. I want it to continue. I hope some of you will help me, for instance, build my tree house, which will become field quarter hotel so I can slide soups and salads down to you on a cable. This will allow you to avoid the starched flower-embroidered guest towels of my house, and will let you feel free to restore osmotic equilibrium over rails 80 ft. up. It will let you mark my house in Santa Cruz on the intersecting trails of future wanderings as a place where you are likely to meet old friends.

—KSN

April 6, 1985

Kern River Gorge below Lake Isabella

The Eleventh Field Quarter takes off. It's a fine group of talented folks representing many different viewpoints and experiences. There seems to be no difficult personalities among them.

We took the route south on 101, across at Paso Robles to Bakersfield and up the Kern River Canyon. The camps were full, it being Easter weekend and so we cut into our nook behind a little hill up a steep slope from the Kern. Our crew spread around, finding places in the grassy swales. Steve and I stayed up by the parked bus and not many yards from the highway. Cars ground, raced, grumbled and roared in both directions most of the warm, clear night. In spite of it all, I slept pretty well once I'd decided not to sleep in inside the bag, but to use it as a blanket.

About midnight two cars roared up, turned in behind the bus, and out poured about seven young folks replete with tackle boxes and collapsible rods. I got up to make sure they didn't block the bus. They trooped over our crew, loud voices ringing in the night. One was lame and being helped by the others down the steep hill.

I listened intently to make sure all was well. They came up at dawn—poachers from South Dakota—whether they caught anything I don't know, but blissfully off they went, vrooming down the hill before our breakfast.

April 7, 1985

Bunny Club

One of our stops today was my first look at the TNC S. Kern Riparian Corridor Reserve. We drove in, unbidden, and Rick Hewitt graciously gave us a rundown. He is

the Davis-trained Reserve Manager. The reserve headquarters is set in a group of old gingerbread farmhouses set on a nice grassy plot set with trees of various kinds.

The reserve is 1,000 acres or so of dense riparian corridor of Fremont cottonwoods and willows. We walked to the brawling, swollen, brown river and thence back to the bus, and off over Walker Pass.

By dusk we were poised to take the bus across the edge of Kelbaker Rd. which had been bladed again. The giant trench would surely have trapped us had we not shovelled for 30 minutes to build a causeway. Even then the rear bumper dipped within inches of the dirt—but we made it unscathed.

It's warm here and I'll bet the days are going to be up there if clouds don't roll in.

Dinner, good music, and then off to the sack. I, for one, slept like a log, the cool desert air wafting in the open window and the red-spotted toads calling down in the wash.

April 8, 1985

Granite Mts.

It's a good group, by golly. Lots of good, pizzazy folks with all sorts of skills.

Today was the first of two days taking groups out.

First we wandered down toward the old pond and out to the beehive. Dawn Breese was along and boy can she spot birds. A sharp-shinned hawk, just a dot in the sky, goldfinches, swifts, warblers, and so on.

The stream had left some pools and seeps so we could look at surface films, wrigglers, and the like—and then we wandered down to the wash and then up to the bee hive, which was in full operation, with maybe two bees a minute entering. None seemed to be coming out. The heavy hum pulsated on twice while we were there—I suppose ventilating the hive.

We tried to psych out how they could find the hive crevice by doing some simple experiments—putting packs near the hole. Putting a piece of flowering Haplopappus at the main entrance caused mayhem for some bees only. These would go in and out several times and then maybe walk in. Others just went in, maybe deviating from course a few degrees upward to the top of the entrance hole.

My crew did well, pinpointing the variability of reaction which is the exciting thing. If it had been a taxis[?] I would expect uniformity. Far from it. Perhaps a cast reacted this way, and perhaps it was the variability of learned behavior in bees. I suspect the latter but can't really separate things out.

Then out into the heat of the afternoon—up around 87 degrees or so, and off to the north to Cottonwood. Everybody seemed a little logy and I was having a bit of a belly ache and then finally a pretty fine muscle spasm that made it hard for me to carry even my daypack. We hunkered in the wash and looked at water striders.

Steve stayed out until dusk watching the unfolding of an *Oenothera* flower and waiting for the pollinator. He suspects a hawk moth, but didn't see it.

Lots of music, good dinner (stuffed baked potatoes), reports (geology, weather), and then people dispersed quickly enough.

The BC porch is getting wobbly. It will be great when it's replaced.

Two cacomistles showed up. One right in a roomfull of people during reports and the other out on the porch—a big adult—ran off with something it rifled from somebody's pack—I suspect toothpaste.

Jenny Griffin and Bruce Bannerman showed up last night. She's out here helping him do this or that kind of work—cleaning Dorner Cabin, filling chuck holes in the road. Nice of her, by golly.

April 9, 1985

Granite Mountains

Steve and quite a retinue including Chris Moscone and Holly Green are off to Granite Plateau to scope out the location of springs and a potential source for the high-altitude cabin that I want to lift up there by helicopter.

The day is clear and bids fair to be hot, so I decided to stay behind in view of my brush with salt deficit (cramps in my back that all but immobilized me). I hope Steve takes care of his associates.

Ann Zwinger is due in today so I will hang around to greet her and to talk to her. She'll be here just one day, and then on south, I think. She's gathering material for a new book, I think,

A couple of groups wanted to hike around looking for lizards, so I ended up going on a long walk down towards Van Winkel. We strolled along, looking at all sorts of things—birds of several species, hand-worked stones, insects and flowers, and then as the day heated up we took refuge under an arroyo wall in an arc of shade. I propped my head on a mud ball, swept away the fallen soil from the cliff, revealing white sand beneath, and then hunkered down for a doze amidst desultory conversation.

Soon we walked back across the swelling land of the pediment. What was unusual—a *Xantusia* scuttling away as a foot rolled a *Yucca shidigera* log, a flock of black-chinned sparrows, a Bendine's[?] thrasher silhouetted.

Herman is an affable, bright hail-fellow-well-met retired air-force Colonel who instantly fit in. I led Ann around trying to catch a *Xantusia*, which she had never seen.

We finally found one, broke its tail, and returned to camp both feeling I'd disturbed too much terrain in the process.

Dinner came and so did darkness, and two of our crew, Aaron Rosenberg and Daria Walsh were missing. The flight log showed them to be attempting to go over the Dike of Jewels from the west side. Since they'd started at 2:30 PM they were predestined to end up in the dark halfway up the hill on a boulder-choked canyon. That indeed is what happened. Steve and I sent out a party to provide a beacon light and see if they could be heard.

They came in voluntarily an hour later, Daria especially revealing her fright at the descent. But they were safe and we retrieved our light crew.

Dinner, conversation with Ann about being a writer, and then to bed.

She impressed me as unidimensional, and not deeply philosophical about her work, though her instincts often expressed are for conversation and protection of the natural world. Her art, which she calls "illustrating" is crisp and nice. Herman is the photographer and well equipped with Rolloflexes and Nikons.

Off to bed.

April 10, 1985

Granite Mountains

I'd thought about going to the dunes but had suggested leaving by 7 AM and that, I realized, was too late. It would get us up on the dune when it was too hot, so swinging with it, we moved our schedule and headed out for Hole-in-the-Wall. Dunes tomorrow. The days have been hot and clear with almost no trace of clouds. Things warm up fast, several of us are supplementing with salts. I, for one, came close with my cramps to being immobilized by it; so these changes in schedule are crucial.

Bruce brought in a packet material that various people are using called "Emergen-C". It's a mixture of tartaric, aspartate, dextrin, whey, potassium phosphate, and other stuff. Section hands have been adding salt to it.

Anyway, we pattered along looking at tortoises up along Granite Pass road, prickly poppies by Kelso, the old Government Road, and then up in Cedar Canyon, not far below the Hole-in-the-Wall cutoff, we saw a green patch up in a fold in the hills on the right going up, which we went up to see. It looked like a patch of wild roses over a spring, but there was no spring and it tumbled over a granite outwash on a fairly steep hill. The patch of very visible light green was maybe 100 m long and half that wide. No rose, but maybe in the family. The plant was in full flower and it was dioecious with numerous yellow stamens on the staminate flowers and divided ovules on stalks (gynophores?) each topped by a stigma. Steve keys it as perhaps oso berry or *Osmaronia*. It looks good except it is far away from its coastal range. (It is *Forestiera*, desert olive or adelia, a member of the Oleaceae). There are other plants in these mountains like this—the *Arctostaphylos* up on Granite Peak, the fir, the serviceberry, the *Garrya*, the goldencup oak, the maidenhair fern—who knows how much more?

Anyway—on over to Hole-in-the-Wall for a good hike down around and over the pyroclastic walls and minarets. The swifts performed on schedule, drawing gasps and enthusiasm.

The owl pellets strewn along the base of the cliffs where the trail canyon widens were great fun to sample. True to form Dawn Breese was right in there and found a bat skull in one, which she later keyed out to *Ladarida*, the Mexican freetailed bat.

I was interested to see the prevalence of kangaroo rats—perhaps a third of the bones. Woodrats and mice were the most abundant forms.

I puzzled over the huge inflated bullae of the k-rats. It is a curious arrangement. The meatus goes right through the bulla and the oricles seem inside it. I didn't find them. I wonder if it is an arms race between rats and owls—the soft flight against hints of detection that let the rat jump and escape. The owl must have few second chances though barn owls do run after prey on the ground.

Then we headed over to the petroglyph cliff at the south end of Woods Mts. We had one student—Cynthia Horowitz—who actually had helped build a gallinaceous guzzler, so stopping at that architectural object was no mystery. Then, later, when the class was up on the cliff, I lay down by the bust and felt the cool breezes sweep over me.

On our way out we hit a section of the Mitchell Cavern road that had been newly oiled. We caught a beautiful red racer, which bit me, and horned lizards skittered across and then a nice big gopher snake down past Essex. Just up the road from Essex was a fine display of desert sand lily (*Lilium mojavensis*).

Gas at Cadiz where the old guy who runs the store seemed on the edge of departing this world—bags under the eyes, the shakes, nearly white, unkempt hair—I think he drinks off hours.

We were back at the cabin before dusk.

We had a grand presentation on the local aborigines in which each person was decorated with a face mask of the Mohaves.

It led to a thoughtful and concerned discussion of how free we should feel to read the Chemehueve myths out of season when the Indians themselves read them only in winter—to do so in another season was to invite snake bite.

There was an aura of magical belief and unwillingness to violate a taboo that might hurt one of our members. I counseled not violating anybody's feelings—if anyone didn't want to read the myths, I thought we shouldn't. There were several who were nervous so we didn't. But I had expressed my feeling that such taboos had a time and place and were from a different culture. They were, [?] social rules that held a society together.

In the back of my mind I didn't want to risk a circumstance where we had an event that was construed as due to the taboo. The power of the taboo hung heavy and its effects at social control were clear and sharp even though the Indians were long gone and we of a different and supposedly more objective culture.

After it was over and we hadn't read it I pointed out that the Reporting Group had "read the myths" out of season anyway. That seemed to be OK, though, but the absurdity crept through a little for some people, I thought.

Then, as we crowded in the dinner line for our falafels, Doug G. shouted "Scorpion! There's a scorpion on her," pointing to Deborah. Sure enough I saw a tan form scoot around her hips and up over a pocket. We searched her and couldn't find anything. Then a few minutes later I heard a cry down the cabin trail. Deb had hunkered down to pee and when she put her pants back on, the scorpion stung her. One of the girls with her stepped on it.

I walked down and retrieved the scorpion for identification and to see how she was. She said it was like a mild bee sting and didn't hurt. I identified it as *Vejevus*, a mild form.

Later Susannah Freeman came to me and told me to think over that event in light of the reading. She had been the most concerned one of the presentation group. I already had, wondering what other people felt. Her concerns and those of several others were a strong feeling of the power of such taboos. Doug Grabill said he hadn't made up his mind about gods and mechanistic ideas, so he didn't want to take part.

Heartfelt and deep, I thought, and a remarkably powerful force for social conformity.

I thought but didn't say, "Well, yes, she was stung, but we hadn't violated the taboo by a public reading. It was a scorpion, and didn't such stings occur commonly enough?"

But Susannah said, "Things like that happen too often not to have meaning."

I thought, "You have a will to believe. You jump to a conclusion about cause that won't stand scrutiny. How human, and how powerful."

Where does the tendency come from? Our human need to generalize from the data of our world drives such explanations. The need to understand, and perhaps the simple comfort of surrendering explanation to a simple clear cause instead of hewing to the skepticism needed to derive classical proof.

Anyway, off to bed after the cabin cleared out.

April 11, 1985

Granite Mountains

Dune day. Up at dawn and out of the cabin by six. The clear heat of the sun through pure blue sky made it clear it wouldn't be long before the dune would be scorching. I told everyone to carry their socks up the dune so when we started back they could put them on and prevent a set of burned feet.

I was surprised to find the dunes nearly barren of flowers and even the burrow bush match dry. I suppose the viscissitudes of rainstorm tracks passed them over other slopes.

Anyway we started across the sand apron looking at tracks. There was a whole convention of sidewinders in one blow-out area, but we came no closer than to follow one into a burrow.

Umas were out in force, though, and we found one dead, apparently bit by some animal, judging from the bite marks—perhaps a sidewinder.

We ascended from the east after stashing our packs under the highest desert willow. I delegated the job of carrying Randy Wells's tape recorder and hydrophone up. Ah, the pleasures of professorhood.

We reached the top at 0930. The air was still cool but I could feel the bite of heat coming up on the sand. I gathered all the folks around, most naked by this time, and told them about dune origins and sand dynamics.

Then we set up the hydrophone and recorder for our great Dune Song epic.

Jim Thorne was our engineer. Frank Murphy was producer—wearing the earphones. Ern Englund was the Maestro, using a collapsible lizard stick to direct the musicians (everyone else). They swam, tumbled, zoomed, and boomed past me. I was Sol Hurok, the Impresario.

I was able to adjust the frequency of the sound by shoveling in the sand near the hydrophone—that produced squeaks or barks, maybe as high as 1000 Hz. When someone jumped hard it made a deeper note, and when the whole slope face began to move a deeper note emanated. I could feel it on my feet—and it seemed about as fast as I could sense—maybe about 30/sec. (30 Hz).

When the whole hillside went, the sound reached down into regions where it may have gone below my hearing and certainly below the level of our little speaker to respond.

Our grand finale was everyone going by on the wide-open slip face. The result was a note that lasted well after (several seconds) everyone had slid to a halt. Also accompanying the actual motion of the dune is a very characteristic white-noise hiss. This stopped abruptly when the sand stopped sliding.

So there is a resonance—and it is very loud within the dune—we had to cut the record level down to keep it from going offscale. I think Jim kept the level constant too, by turning up the volume as the sound went down. Oh hell, that probably did in our diminuendo.

If we assume that sound travels 2X as fast in sand as in air, a wavelength of 30 Hz sound ought to be about 5 ft. Now if there was a reflective layer down in the sand, say at that depth sound could resonate back and forth between the surface and the moist layer.

There could be traveling waves laterally too a la the sound channel in the sea in which lateral reinforcement occurs.

The moving mass of sand should be lozenge-shaped, that is tapering in all directions.

I suspect that the resonators may be tabular magnetite grains that rub over one another [drawing].

So, within the mass there are millions of little resonators, below and above a reflective surface, and laterally the sound could travel in the dry sand. Certainly the sound is much much louder in the sand than out. There. I've said it.

Anyway, we headed back to the cabin, dessicated and ready for lunch and a nap.

We had a nice session around a campfire over by the water. Adam Rose especially, produced some grand music. He has real facility with the guitar and a very graceful voice. Neat guy, too.

As a matter of fact the group is a splendid one all around. Everyone is convivial, there are many points of view, intelligence is everywhere, good spirits abound. A group of beautiful caring people with whom one can share the wild world, and with whom one can learn too. That's the magic of this—the opening of this diversity and the sharing of streams of life, of the vibrant aspirations of these young people—the best there are.

Erin, Blythe, whistling toad calls on the deck. Marshall doing her stretches before going off for a run. Jim Burkey changing his shirt after a long hike up behind Quimby's nose. Tamara puzzling over a list[?] of squaw bush with galls at the leaf edges. Ania perched crosslegged out on the deck scratching notes in her everpresent journal (courtesy of Prisma products).

Steve is up on the wood bridge in his favorite spot sipping a beer. He's so much more in command of himself this year, so sure, so mellow, such a terrific complement to everything I do.

June 6, 1985

Dechambeau Creek above Mono Lake, Mono Co.

People are scurrying through the aspens bringing in their gear. Steve and Marshall and some others are down spading Jan S.'s garden as a kind of pay for using our lovely campsite.

It's a china blue day with the disc of the lake shining below.

Last night we built a nice fire down among the willows in a fire circle of some other party. Our group gave a nice summary of the local geology—Long Caldera, the Sierra, ancient life.

After that Cynthia H. and I gave a nature note about how we drank [from?] a certain creek and fell asleep only to awaken very small, struggle our way through the giant willows, lean against the paved side of a sleeping rattlesnake, climb laboriously up to the fountain of youth, descending in a Perrier bottle ballasted with rocks to tip over and ride up on the top of wavering, spinning gas bubbles rising from the spring bottom 50 ft. below.

Before that we all took a long hike down to the lake shore up to the Fountain of Youth and some up Wilson Creek to look at the vertical canyon walls and others up to Black Point. I was adjusting to the altitude a bit so took the short route.

My major adventure was trying to cross one of the creeks entering the lake and having the bottom swink away below my feet. As I went deeper and deeper in, my zoom lens, hanging down from the camera around my neck, dipped in.

It imbibed water in the end, and a little puddle can be seen through the end lens. But miracle of miracles, I'd gone far enough upstream so that there was a halocline—the corrosive lake water below and clear stream water sliding above. Only the clean water appears to have entered.

The usual man-eating noseeums are out, nipping at collar and hat line. They're vicious little bastards. Mosquitos, though, aren't very evident.

Well, I'll sign off for now—the engine is warming up, the bus is loaded, and we wait for the garden crew to return and then we are off.

July 5, 1985
Anchorage, Alaska

Seeing In Nature

History—What does one do? I found that at first, it is often very hard to see very much at all.

As an outside boundary there's fear—and that shuts the eyes almost completely, especially in any place we don't know.

But even without fear there are things in the way, and like dispelling fear they are mostly internal things to the observer, that must be swept away so the view is brought into sharp focus.

But not all that the observer brings is troublesome. There is also the essential imagination, the essential experience that lets one ask penetrating questions of nature, and there is the wordless emotional perception of the outside world. This world of the senses and emotions requires no more than an alert presence.

This is, I think, the world of most other higher animals on the planet. The emotional, wordless world is a magnificent, vibrant one, full of beauty, love of the land, the fears, the smells, and the glancing light of the artist, the harmony of shape and color, of birdsong, of the relations between animals and the silent harmony of the system, the place. It is to this world that we appeal as we assemble a "sense of place," or as the ecologists' more stilted language would have it—"habitat selection."

One can gain "wisdom," I think, in the unspoken world, but one does not unravel the discrete stories, the individual pieces of the puzzle in anything like the same way. One deals in metaphor rather than words.

Parenthetically, isn't that what animals are likely to do, and isn't our tendency to dream in metaphors an indication that this most puzzling of human doings is very ancient in source and in our history?

As always the emotional half of our being to some extent wars with our rational half. The two are not perfectly mated even though their aims are, in the last analysis, the same. That is to say, both together let us be human and function successfully in human terms.

I like to let one have its say and then the other, so that the powers of each may fully as I can make them be parts of my seeing.

It takes some doing since the doings of right and left brain are so inextricably mixed in our perceptual affairs, and yet require such different supporting behavior from us.

Let's say we want to watch a swift drink at a pond. First, I say, sit quietly and take it all in. Pass no judgments and ask no questions. Let the natural frame around the event soak in. Watch the flickering, volplaning birds arc down a canyon of air on to the shining pond. Watch them dip, leaving a spreading, pencil-trace of ruffled water and then arc up and away, wings flickering so fast eyes cannot truly follow. Sit for an hour watching the echelons of swifts come in and then leave to become gliding specks in the distant china-blue sky. You've learned something of the larger frame of "swift life."

Stand up, shake the loose granite crystals from your pants and prepare for the hardest part. You now have the beginnings of a complete frame of birds and world, of rocks and pond, of life and land, within which analysis can occur. To build a true larger frame for some events may require months or years. Some relationships are of course elusive and setting the experiential frame is a matter of truly living with the circumstance. . . . You have a guide that nearly always will provide a measure against which . . .

The next step as I do it is to continue circumstances that let me push back my part of those emotional connections to the world as best I can, and to watch events with as little intrusion of my . . .

July 9, 1985

Wrangell Mtst. National Park, McCarthy, Alaska

Phylly and I sit 200 ft. away from the face of Kennecott Glacier. They say this toe of the glacier pulses. Right now it is "deflating" and retreating, but sometime ahead it will send a surge down its ice river and push out again toward McCarthy, a mile down the canyon.

When it surges, it is supposed to swell higher as the viscous ice surges down canyon. All fluids—air, water, ice—are alike I guess and this huge, dirty plastic river is no different. This is the so-called Kinematic Wave.

I'd guess its wall at about 100 ft. high here—a 45-degree slope at the top extending downward a half or less of the slope and then a vertical drop or even overhanging cliff to the water. A wedge of air indents the cliff bottom above the milky glacial melt pool. This undercut wedge goes under the ice cliff 10 ft. or more. It is a wedge, sloping to within inches of water level as far back as I can see and widening to a couple of feet at the outer margin.

The face is constantly pelting down rocks of all sizes, some landing in the extensive pond at the glacier edge, sending up towers of brown and white water. Others crash into boulder or ice piles with sharp, clattering reports or deep, booming crashes.

The glacier freights an enormous load of till and cracked rocks of all sizes, from gravel that sizzles as it streams over the precipice to house-sized blocks of porphyry that must send up enormous towers of water and sound as they arc into space and then land. We can see that many have fragmented as they landed and projectiles should sometimes reach even where we sit.

Our seat watching this spectacle is precarious enough—atop the till over a calved slab that melts and slides behind us into a subsidiary pool. It's unnerving to hear sliding and crashing on both sides of one's vantage point.

The glacier face runs with rivulets of water coming from the melting face. The layer of till slides as it is undercut, plastering the 45-degree slope brown with mud. The vertical face calves off great vertical sheets that tip backward and fall at the glacier base as they are undercut and as they erode inside, probably along cracks. We can periodically hear rumblings from inside the face and once watched a four-ft. boulder fall inward to boom inside the glacier.

As the big rocks fall and hit the pond they send shock and displacement waves under the ice with a staccato collapse of the roof of the undercut following, and sometimes clearly enough, arcing blocks of blue ice from above fall and undercut the glacier.

One can see that big boulders from the till burden sometimes sink into the ice. One sees them set like raisins in the face, all the way from the surface down 30 ft. or so into the glacial mass. Below that it is blue, without soil or rocks, showing that the burden a glacier carves and carries is primarily borne atop it and doubtless carved at its edges and added to by alluvium from above the ice; lateral moraines that coalesce.

The glacier face is streaked with curving lines that intersect like crossbedded sandstone and are probably formed the same way. Or are they marks somehow, of the plastic deformities in the ice as it bends and pulses?

We waited, watching the rivulets and the shower of boulders, and even uprooted plants, for one of the giants to fall but but none did while we watched, though several were so precariously balanced and being undercut that their fall seemed momentary.

In the gathering dusk we turned our backs and headed for McCarthy. "Don't turn your back on a glacier," they say, and as we walked away a shuddering boom came—one of those precariously perched rocks finally lost the bit of gravel that held it, and arced out away from the ice face onto the debris below.

The till burden carried by the top of the glacier accumulates here at the toe over the whole surface of the glacier by ablation, or melting from the top down. Farther up the glacier only the merging morainial lines mark the white ice with curving longitudinal lines of dark soil and stones.

The ablation surface may appear to be wholly a field of till, but a closer look shows it to have exposed ice faces in many places riven with vertical water runoff lines. The ablation topography is hummocky in the extreme and here and there sharp triangular mitred peaks stand up. A further look shows that in the deepest places ice water streams run and finally pour either off the ice edge or into its mass through swallow holes. The till is thinner than it appears at first glance. Most of the topography is ice, coated with inches or a foot or two of till. Thus the shape of the ablation terrain is largely the shape of the melted ice. Those mitred peaks are faceted points of ice formed as the sun heats the surface till and its interstitial air. The piled till probably does not slide because of material below it but merely lets the ice melt in place, its meltwater running down the topography and its process moving up-slope in a headward fashion just as ice cutting does to the rock beneath, resulting in a steep-faced mitre as headward processes meet. The angle of the slopes must stand at "maximum angle of repose." [Drawing]

Does slope angle vary with angle toward the sun? Is the face away from the sun different than that toward it? I didn't learn. Water in ice meanders very nicely, even on fairly steep slopes. It cuts in so effectively that I suppose a meander form can occur when on soil it might not persist as the soil was washed away.

July 20, 1985

Kennecott Glacier, Wrangell Mts. National Park, Alaska

The whole group of us walked up to Kennecott and thence out onto the Root Glacier with Ed La Chapelle, in preparation for the class glacier hike later next week. It was an interesting time.

Root Glacier comes down off Mt. Regal, tumbling in a gigantic ice fall—stairstep blocks of ice on a 45-degree angle slope for 2,000 ft. and then regroups into a white river of ice, which was the way I found it a mile above Kennecott. Glaciers seem to heal themselves from such splits. I'm told my intersecting curved lines at the glacier face are just that—places where a shear plane developed in the ice horizontally, when, perhaps, the sole of the glacier caught on irregular topography and the flowing ice above split—only to reheal and perhaps split again leaving intersecting marks on the glacier face.

I walked out onto the ice. At its edge it is steep and muddy. Higher on the ice it levels and undulates. There are, to be sure, erosional valleys in the ice, rivers on the ice, falls, and the like that are steeper. But one can walk easily without crampons in most places by watching one's step.

The sun was out so the ice was melting and rough. I stood easily on fairly steep slopes. But let it cloud over and freeze and I'm told it can turn to glue[?] and one cannot stand without crampons.

The till of the glacier accumulated as the ice melted. Here and there handfulls of dark pebbles accumulated and they became heated by the sun and then sank in little pools of ice water atop the glacier.

These merged into streamlets. One could see how ablation could, in time, accumulate till atop the glacier.

In places fissures split across the ice. The ones I saw were narrow, an inch to half a foot in width, but blue—turquoise as far down into them as I could see. Sometimes, streams ran down holes into the ice, probably piercing the glacier to the roaring stream below that had coalesced from many such sources. Some of these are dangerous pits piercing a 1,000 feet of ice, tumbling near vertical and surrounded with slick, sloping ice—traps for the unwary.

Yaakov had his ice axe slip nearly into one capable of swallowing a person and he had to be belayed out onto the ice to retrieve his vital axe. An unwary person could easily have slipped, slid, and been swallowed up in a plummet inside the glacier. There are, to be sure, traps out there.

I walked back from the group, who were going to test crampons, ropes, and the like (I had none) to join Phylly up on the trail. We walked back the long trek to McCarthy down the old Kennecott Mine Roadbed.

The minebuildings are mostly falling into decay now, but much is left—the giant boilers, the stamp mill (the stamps were removed)—but bunkhouses, offices, gymnasium, residences, and more remain of a once-thriving town at the glacier edge. We met people who had lived and worked there—come with wistful faces full of the past to look at the silent, peeling, decaying hulks.

[this is the order in the journal]

July 8, 1985

Wrangell Mts. National Park, McCarthy, Alaska

Today is a long-postponed day. We hike to above timberline into the Alaskan arctic-alpine, which we can see on the mountains all around the valley. I'd guess in most places its about 2,000 ft. above the valley floor.

One of the local residents, Jim, met us at 9:30 with his hay wagon and very spastic Jeep pickup vintage at 1947 and pulled us up the five-mile dirt road to Kennecott. This was the mine headquarters where the crusher and the business end of this giant copper mine is located. Now it is a series of decaying red wooden structures, some like the one processor, huge, tottering edifices of shrinking boards, rusting machinery, and peeling paint.

Above, far up the mountain were three mines, one said to be the richest copper mine in the world. It was in these precarious remote mines, shops[?], and bunkhouses that the miners stayed. The staid, family-oriented community of headquarters was not for the miners, and they passed right through to the pleasures and booze of McCarthy down the road.

At the headquarters the gymnasium was identified as was a school and various other buildings, all served by a regular-gauge railroad that stretched all the way to Cordova when the mine was active. It closed in ____.

Our hike up, participated in by the whole class of 15, was to look at tree line and the arctic alpine. I expected Krumholtz and old trees, but that was not at all what I found.

We started up through dense alder and willow thickets on a relentlessly uphill gravel road that wound past the upper works of the town and then into untenanted, vegetated slopes, with dense undergrowth of several flowering plants in addition to the two predominant species. White spruce was common and of close-needed spires usually 30-40 ft. high or so.

Chiming bells (*Mertensia*), a lovely borage with pendant blue flowers was everywhere as was a rather large-petalled, pink wild rose. It was a steep but not unpleasant climb on the cool, partly overcast day. Gradually the vegetation became more open, the willows lower, and the alders all but dropped out. Bunchgrass became common as did a low alpine birch. We left the birch trees behind. Flowers became more numerous. *Trientalis*, a low-growing white dogwood, Nagoon[??] berries, a *Ranunculus*, a lovely white anemone, a low-growing, white-flowered *Dryas*. A juniper appeared—a low-growing mat plant here. This began to thin and become lower. Finally at a lunch stop a cushioned *Phlox* appeared.

At lunch class members produced stoves and made hot tea as clouds swirled not far above us.

Across the valley we could see a rock glacier descending a steep, U-shaped cleft from the main peak above.

Its lobed surface of rocks was grown with arctic lichens—yellowish curves defining the topography. One could almost see the viscous flow, ice below amid the rocks.

Phylly turned down to wander at Kennecott and I went on up to a tram station set high on the steepening slopes, almost amid the clouds and up amongst the snow patches not yet melted.

Ben Shaine cut a poplar to see how old it was—at 2-3 in. it was only 10-14 years or so old. Later, near the tram station, he cut another, a spindly willow an inch or so through and it read 35 years. Heather came in as did shooting stars and some other low-growing alpine mat plants. No Krumholtz at all. No old plants so far as we could tell. Nancy Summermann says it's still in disequilibrium—the march to treeline continues she says.

But there is a transition, even if the players are not all here. I suspect it's regulated by growing season. High as we were it was only 4,000 ft., so UV and other truly high effects are not involved. June-September/October at best and much of that cloud-shrouded up there. Many plants were just reaching blooming condition, though. Chiming bells seemed farther along high up than below. Their flowers were becoming pink while below pure blue prevailed.

July 25, 1985

Thoughts Upon Re-reading *A Sand County Almanac*

Leopold's clarity of vision is almost as pure today as when he wrote it. The major change is that the ecological ethic is taking hold, though it seems malformed frequently enough with the various viruses Leopold saw.

To me his ethic does not go as far as it needs to go. Not only do we need to understand and live the fact that we are just part of the world, but we need to extend ecological consciousness into what might be called "evolutionary consciousness." We need to seek out and understand ourselves in the evolutionary sense. In such a search lies answers to the inequities in our society and relations to other societies as well as to the ecological world at large. "The naturalistic ethic."

Putting a monetary value on temples is an attempt to quantify and evaluate the spirit. So it is when we seek to put the value of wilderness in dollar terms.

Why do humans gather in cities?

How deep and pervasive is appreciation or need for "the wild" in each of us? To love the land we must somehow know it. Can a person in the city slum have such love, or does fear so predominate that appreciation is lost?

Am I wrong to feel that "land love" is somewhere, somehow in all of us?

Leopold rightly calls for a land ethic, saying our tendency to give the job of conservation to the government tends to absolve us from doing it.

We must join ethic with government. Much the individual cannot do alone, or even collectively. It's a matter of scale. Some needs are simply too great, and our understanding too incomplete.

A fossil unearthed he says, comes from a place where there is no time. But there is, its march the slow end of the cycling-recycling world. the carbon in the trilobite had been locked in place for 500 million years, but now it is again ecological currency. Between that fossil and the daily mobilization of O₂ from a plant are all other speeds of recycling into the life process . . . some nearly as slow as the whole span of life on earth and some immediate, and everything in between.

Our view is so short, so limited, that we perceive and understand mostly the immediate. This masks the fact that the whole world is inextricably limited to the history

and processes of life and truly the world evolves as a whole—its life, its continents, its seas, and its gasses.

Leopold talks of the A-B cleavage and land health. A's put prices on things. B's are ecologists regarding the land as biota and man as part.

The first type are creatures of the industrial revolution: "If I do this, I get that." "Get" is the point. B's get everything including themselves.

Science is accused of being an "A" activity (linear, reductionist), but its methods are as applicable to systems as to linear events.

Science works by examples and this tends to atomise processes and relations but it also seeks to synthesize between examples—to develop general rules within which examples can fit. Systems and different levels of integration are best understood through the scientific method.

I suspect science rose out of reaction against the dogma of the church—covert, at first, railings against the pronouncements of the clergy—logical refutations of doctrine. That the reasoning process itself was pitted against the "revealed word of god's servants—and the battle was on. A key feature must have been to reject dogma that did not stand this or that logical test.

June 9, 1985

Grandview Campground, White Mts., Inyo Co.

Yesterday up in Wyman Canyon, I stood to my calves in swirling, glinting water, naked except for the camera hanging from my neck. Down the narrow canyon, cries issued from four sleekly tanned people partially obscured under the falling glassy sheet of a 9-ft. waterfall. The water pummeled them, seeming to force out these cries of wordless pleasure—Holly, Adam, Deborah, Tamara.

Ten ft. above the water a lithe, dark-haired figure crouched in the sun atop a polished slab of fluted granite, in a hunkered aboriginal pose of knees against chin, with brown toes slanting down, feeling the inequalities of the steeply sloping rock—Kelly.

I turned to face upstream where the creek's flow split into two little stepped cascades running between lush, perfect fields of green horsetail rushes. Above that a willow arched over the water, casting it in dark-green shadow.

At my feet the water flowed like uneven glass, focusing and unfocusing the half-inch cobbles of the streambottom—brown, gold, pale tan, and amber. Below me the water crowded into a smooth, granitic sluice. The sheet V'd and slid in a downward arc over the boulder face. It merged into a roostertail ridge from whose crest silver globules of water were hurled into the air over pure white foam.

Did my friends and I belong in this perfect stream? Was our tread among the horsetails an affront, or was it part of the life of that cleft canyon?

I wondered about the sense of perfection indistinguishable from love that swept over me as I watched the glowing colors of the pebble bottom, and when I thought about the free cries of my friends, free of the pretense of masking garments . . .

Early in the quarter I suggested that an important thing we would be doing would be examining "the wellspring of caring about the natural land and its life."

Why, after all should we give a damn if the human race changed the world, and if the new one didn't have pinyons and free-running streams?

What tells Daria that she should enlist to save Mono Lake and thereby to enter a wrenching struggle over power and vast sums of money when the aim is to save that disc of blue, its black mountains and islands, its dabbling flocks of gulls, grebes, and phalaropes as a symbol of much larger inequities in our society?

What does Jim seek when he wanders the world, guitar on back, to write songs of the beautiful bells in Swiss alpine valleys or to learn stories of djinns and magical [?]?

Or why doesn't Susannah avoid the surely coruscating human drama of modern-day Kenya? What about Kirsten in Alaska, Beth in Boulder, Howard in his beloved alpine lake, with his dreams of the Sierra ridgeline? Or Holly, Adam, Chris, and Steve, soon to be on that barren granite ship-island in the desert? Or the rest of you in your personal journeys of care and exploration?

The broadest commonality that I can see is that present-day science alone, is not enough. A larger view stirs each of you now that combines the simple-seeming emotional love of the land, with what we can dispassionately learn about it. Even though two of us are card-carrying scientists, we are that way too. So the question shifts a little and becomes two. First, what's wrong with present-day science as a base for natural philosophy; and second, if we can pin down where our elusive love of the land comes from, is it the missing piece? Very nearly, I think. Together they form what I, at least, mean by natural history, as well as I can perceive its shadowy boundaries right now.

What about my first question? A whole generation now skirts science, touching it gingerly as if doing it can somehow degrade our experience and our perceptions.

This perception is, I think, correct. We need a more generous, more encompassing science. But I also feel we must not retreat and think we now know everything we need to know. Although in the last three centuries or so, science has wrought a major revolution in world history, and we now know most of the outlines of how things work, our needs for knowledge are far from over. In ecology for example, we have only defined part of the problem, not its solution.

Having said that, what's wrong with present-day science. I see two major areas of contention. First science seems to wring out all emotion, most beauty, and most grace from the world it builds. There is left scant space for the "rightness" of our afternoon in Wyman Creek, yet we viscerally know better. Any adequate natural philosophy must allow scope for the emotional wordless world to enter. We know "the wellsprings of our care for nature" include these things quite centrally.

Second, science seems to dump its information mindlessly on a world scarcely able to assimilate or deal with it. There, for me, the choice is direct—either attempt to restrict our minds and opt for a world in which truth is selectively available to build our philosophy or press ahead with the unfolding story.

For me this choice is clear. I want my philosophy based, as closely as I can make it, on true things. I don't want to retreat to a world of dogma and magic, of explanations made whether or not we had the supporting facts.

Our human history, you know, has been to explain the world whether we could or not, because having rules for living was expedient and gave control over those who wish to follow, even though the rules might be imagined.

The power of science lies in its rejection of this method of social control. It first tells us how we must proceed if we are not to lie to each other, and second it tells us how to shed dogma as a regular course of events without social revolution.

None of this speaks about technology, which is the social application of natural law, and I won't say more about that difficult debate of our times here.

So, I want a science that includes us, our unspoken world, the animals and theirs, the plants, and the ecology.

It has to include us lest we never reach mountain time. No system that separates us as we really are from our world can be real, or adequately explanatory.

No explanation that omits our care, our camaraderie, or our deep affection for each other will do, for it is the glue that joins us in our quest, and that makes it worth doing.

No explanation that excludes jokes and laughter will do. They are the rapiers that tear away pretense and unmask false explanation.

No explanation that omits music and the exercise of our physical beings will do, for they define our fitness and even the very ways we organize our thoughts, our explanations, and our language.

What then are the sources of our love for the land? I suspect they lie very deep in our preverbal emotional beings, and I expect them to be widely shared by other animals.

The calculation that we and the chimpanzees share 99% of our genes doesn't surprise me. After all, by the time our natural ancestors were around, most of the evolutionary work needed to form us both had been done. The intricacies of our muscles, bones, hormonal systems, DNA, circulatory systems, and yes, even behavior, were there. Even the beginnings of language were there.

Surely also our wordless emotional attachment to the wild world around us is also largely shared. Surely our love of the land springs from ancient roots in us. After all, even in our two million year history, only 1/20 has been spent in civilization.

This emotional attachment speaks clearly enough of ecological balance, of the silent ticking of the mountain, of the things our science has only defined, not solved. When we slow to mountain time, we come closest to the inner peace of our ancient balance; we reach best for bridges between our modern world and all that built us. Those, I suspect, are the wellsprings of our care.

They are also why this odyssey of ours, which refused to deny our emotional love for the land, its waters, and its amber stream-bottomed stones has unlocked such marvelous diversity from each of us, far transcending what any one of us could bring alone. Our experience has been a collective one, based on a marvelous diversity of viewpoints and experiences.

This environment of equal "air time" for each of us has achieved what I wanted most—that each of us follow our own unfolding path of exploration supported by the shared perceptions of the others.

The bonds that have been built between us, will often persist a lifetime. I embrace you, each one, in deep fondness and as a treasured traveling companion on the journey just begun.

October 25, 1985

Rio Vista, Solano Co.

Well, four of us are perched atop a bridge over Shag Slough—Randy Wells, Sue Kruse, Ken Marten, and myself. We are watching an operation to chase "Humphrey the

Humpback” out of the river and into San Pablo Bay. It’s been in the papers all week and they finally tried an idea of mine, the use of Oi Komi driving, using metal poles. It worked for a mile or so yesterday, but the whale refused to go through the rickety old bridge on which I sit. Humphrey is getting tattered, perhaps from sun and perhaps from osmotic stress of the fresh water on his skin. The day is sunny with a light breeze. They will try again today after having removed some old pilings from between those that hold up the bridge.

Diana Rees called me yesterday and reported the whale clicking as it “inspected” the pilings, just as if it echolocated. Maybe it does. If it does it should express bubble streams from its nasal valves, and if so this could have relation to the evolution of echolocation. So we are here to observe and record.

We drove up and entered the zoo at 9:00 AM, a field headquarters had been set up in a construction co. headquarters N. of Rio Vista. The press was everywhere, Fish and Game was everywhere, whale types were everywhere, Senator Garamendi and his staff were there, and Rep. Leon Panetta called in. I was whisked off for conferences and lost my team briefly, but finally was reunited and we made our way up by Fish and Game vessel. Possum cops were everywhere being official. An entire troop of California Conservation Corps. lined the bridge to dump a plastic barrier behind the whale should it go through the bridge. I hope it doesn’t turn and become entangled. The plastic should be acoustically transparent.

So we went while the boats are upstream banging on their pipes and working their way toward us.

The boats took up station across the channel with maybe 75 ft. between them. Seven of them turned the whale toward us and crept along as it zigged and zagged across the slough, ever closer to us.

It came within 40-50 ft. of the bank and turned again, usually 100 ft. ahead of the boats, blowing only occasionally. It’s only 300 yards up slough now, coming closer.

It is 200 ft. across and seemed to sense the bridge and to turn away in a circle. The pipes can be heard and chinking intermittently. It took a wide circle nearly across the 100-yard-wide channel.

Here it comes, again.

Circling and blowing 50 m away in the brown, nearly opaque water. Its 80 ft. N. of bridge, circling as boats approach. The pipes were about 10 ft. sections of 2-in. pipe, capped on both ends and filled with water. They were lashed over the side of the boats and when whacked on, the upper end made a very loud, metallic crack. I was quite surprised what a din they made and it must have been much greater underwater. Even from 200 ft. away the whale reacted strongly and could be easily turned. In more open water a semicircle of boats would have been required because the whale tended to zigzag back and forth in front of the boats moving slowly downstream.

When they get in open water they will need a good semicircle of boats to guide the whale because of its tendency to move at nearly right angles to the advancing boats.

The boat operators were frightened of the whale. Once when it slapped its pectorals in frustration while near the bridge, the boats instantly all backed up another 200 ft. even though they then were 300 ft. from the whale. I hadn’t realized how goosy everyone was. Later I told them what a marvelous example of Skinnerian one-trial

learning it had been. The whale, I said, had trained them to back off with a single wave of its pectoral. Sheepish looks.

The people at the bridge were all tired, frustrated, ready to give up, and Debbie, Diana, and Mark were remarkably unwilling to do anything that would agitate or disturb the whale, even though to so hang back meant the death of the animal. I found that mindset hard to take and pressed hard for driving the animal until it went through, which it finally did. I wanted it done subtly, but with quiet force—keep the pressure on when driving, said I.

Its skin is speckled and brownish and though the dorsal is white on its margin, I see no sloughing skin. It seems to move pretty normally to me.

It circled within about 30 ft. Boats all but stationary 200 ft. back. That time it circled within 30 ft. no bubble trails evident.

The big white pectorals sometimes slide[?] [over?] the surface on these circles. The pectoral came up like an oar sculling.

Its pectoral circled within 10 ft. just below me. Closer, closer. All covered with barnacles and white. I'm in the blows every time he circles now—drifting, odorless spray, very fine, showing rainbows.

He turned on his side, sank, and sulked, perhaps 30 ft. N of bridge, staying down 5-7 minutes and then began a tight circle again, 30 ft. N of pier—no bubble trails at all.

Hanging facing bridge 20 ft. ahead of him, right below me.

I see streams of bubbles from corner of blowhole as it faces bridge. Following that it wallowed into a tight turn, flippers and flukes showing and bubble bursts boiling to the surface.

Somehow it senses the bridge in the water that has 8 in. visibility at most.

There were probably 40 reporters all in a gaggle off to one side of the bridge and the CCC off the other side giggling in the bushes in their helmets.

As for the whale, it finally made its way into the bridge shadow, a thing that had dissuaded it earlier, and then bolted through. But by that time I was in a conference with Sen. Garamendi and the leadership of the Naval Weapons Station at Concord (where the nukes are kept). The whale hit obstructions under the pier and seemed to have trouble with its long pectorals, but made it through and bolted to freedom down the long empty channel.

Garamendi planned all the details—press, planes. Bruce Mati will fly in with a radio tag. I dissuaded them from trying to dry dock the whale (40 tons of whale can kill you). He is a handsome, articulate guy of 40—a liberal conservationist—a real comer—a Harvard MBA, Ethiopia in the Peace Corps.

At first I couldn't find my compadres but finally they appeared and we drove home, having dinner at the Terminal Restaurant—it was better than it sounded.

Does the whale echolocate? I'd guess it may in a simple way. Many of the clicks seemed to come from outdrives, not the whale, but quite a lot of grunts, chirps, and grates[?] did come from it as it maneuvered in the channel.

The whale clearly did avoid obstacles. It circled and avoided the banks, and especially it stayed some distance away from the bridge. It paused and circled from my estimated 200 ft. N of the bridge and refused at first to approach closer than 30 ft. or so repeatedly. It stopped, head pointed directly at the bridge, twice, for many seconds. Phonations accompanied these bits of behavior.

What could have mediated these things? Well, it could have touched bottom (about 20 ft.) with one of its long pectorals. But the circling in advance of the bridge or the stationing closer could not have been done with a pectoral.

Could the bridge shadow, which was cast in the water have been involved? This shadow hit the water about 10 ft. from the north side of the bridge and the whale came close to it but almost never entered it. The whale's eyes were located about 8 ft. from its jaw tip and would have been more like 12 ft. from the shadow when stationing. It's hard to see how the whale could have detected it from so far away given the 8 in. light penetration in the water. But, perhaps . . .

When a "cracker rifle shell" a concussion device, was later fired by CF&G personnel at the whale, the whale promptly ran on a sandbar and finally floundered its way back into the water, as if its navigation had been disrupted temporarily.

The streams of tiny bubbles are suggestive, too. They came from a lateral corner of the blowhole (right in one observation) and lasted two or three seconds at most. The streams of bubbles I saw were a foot or two long and contained a dozen or two dozen bubbles.

When we look at the tapes we will see if there are sounds with this many pops.

Granite Mountains	April 1986
Steve Gliessman's Journal, Inyo Mts.	June 1986
Thoughts at the End of Field Quarter	June 1986
Joel Dunlap's Last Day Notes	June 1986
Granite Mountains	April 1987
Observing	April 1987
SNARL	June 1987
Thoughts at the End of Field Quarter	June 1987
Democrat Springs/Granite Mts	April 1988
Vaya Maria Padaskeva's & My	
Great Adventure	April 1988
Niche Hunts	April 1988
Thoughts at End of Field Quarter	May 1988

April 7, 1986

Granite Mountains

It's morning, and the food group has provided me with a splendid cup of coffee, so I've repaired to my bunk for a few notes.

We left Santa Cruz under threatening clouds and headed down to Paso Robles and thence over to Wasco. Frank Murphy and Steve Gliessman are driving—two steady, cool heads at the wheel. The class is a talented one—the 12th Field Quarter.

We slipped off to the Kern River Gorge under our big digger pine and it was still deciding about rain. Joe Jordan said a big low-pressure system was off southern California, so we were likely not to escape it, even out on the desert.

So we bedded down hoping to make it through. We didn't. Steve and I ended up under the bus inches away from a sharp metal projection that inhibited my movements. At least I found it before hitting it with my head.

The flowers are out in some force so we keyed a bit and listened to Steve tell about Mediterranean grasses and then headed over the Walker Pass, down into Inyokern, and thence out to the Garlock Fault valley. There we looked at pressure ridges and fault traces and talked about rotating blocks. Sarah Finnemore, a transfer student from Williams and I had a good time arguing about structures.

I slept to Barstow, and then enlightened one and all with tales of Pisgah, Hectorite, playas, and the like, until we cut off Kelbaker and wound up the desert road to the BC—all clean and secure. Many exclamations from first-timers as we stashed food and other stuff in the upper cave and prepared food. I got a nice fire going and soon we were cozy and warm.

Dinner out of the way, we settled in. I, for one, was a bit spacy and travel weary.

April 8, 1986

Granite Mountains

Steve and I started our guided tours, his a plant-community one and me, my observation stuff. I have a couple of new ideas that I talk about—one is the Gestalt—the soaking up of a scene to give you a frame within which to ask questions and the other the right brain/left brain affair. We really do impose pattern on our observation and it stifles seeing new patterns. But having got around the inner template in various ways, one needs access to the left brain for concept formation. Here's where the iteration with a notebook comes in. One thinks while writing and ideas come out of the pen tip. One deals, I think, in relationship at this level. The analogic mind is accessed for pattern and then the relational mind takes over. The playing out of language is an exercise in complex relationships . . . the ultimate symbolic representation. But seeing it isn't, except inside the mind. Math, since it sometimes has no access to outside real-world patterns and forms, is the ultimate relational activity—the play that explores the limits of such a mind. But it is militantly symbolic and hence digital and is only related with difficulty to the analogic outer world of graded systems and emotions and metaphors. Yet the evolved patterns of the wild are of these things—a world of ultimate interaction in many ways.

Yet life is also digitized at a very basic level. Vertebrae are divided into myotomes and articulated vertebrae, ribs and the like. Ganglia, lymph glands, rods and cones, nerve impulses, synapses, compartmentalize the analogic reality stream into manageable generalizable segments.

The class is a lively and talented one, and a diverse one. Some are very experienced. River runners, biologists, geologists, ethicists, artists, and more. We have our truck drivers, train riders, musicians, dancers, bird people, developmental psych, and outdoor ed people.

April 12, 1986
Granite Mountains

Well, much has gone on in the intervening days. It's a wonderful, diverse, lively class, and it's together too. Today I drove over to Granite Cove where Phylly was staying with Dick and Teresa and we headed up the new trail (the Monolith trail) to the Plateau.

Dick and Frank Murphy and I pulaskied and shoveled, and in the end produced about half a mile of a very nice trail up from the cove. We nearly reached a little plateau with a remarkable vista of the cove, Bristol and Danby Dry Lakes, and over to Van Winkel Mt.

It was a great pleasure to see a real trail emerge with nicely thought-out switchbacks and a nice granite gravel tread. Up above we have much work to do.

Joe Jordan was with us—he's been a wonderful resource person. He's a marvelous teacher and a warm, committed person and has given a good lot to us.

About halfway up I rolled a rock slab and there was a *Tantilla utahensis*, the black-headed male. Its head was gray all right, but not black; its body honey colored and its venter pale vermillion. I'd guess it was 12 in. long. Dick put it in a water bottle and we kept climbing.

It was a warm but not hot day, but the work warmed and drained us. I was pooped by the time we reached the little plateau and welcomed lunch sitting on a rock overlooking the sweep of the desert. Then, on and up across to Juniper Spring and over two bowls to the "Chateau Plateau." Dick and I relaxed, drank a bit of lemonade left by Adam and Holly for us. What a nice gift!

Later they came in, two warm and wonderful young friends having a special time with the singing pines and the scudding clouds. They seemed so happy. The cabin was full of evidences—notes on the wall: “Holly made 12 great discoveries today 4/9/86,” “Adam did amazing carpentry today 4/11/86,” for example. Such a simplifying experience! The mountain, no road or visitor most of the time, only the sun, the slow stream, the 12 wandering cattle, including a bull and two calves. The spring is ahead of the cattle—right now. The squaw waterweed is bursting with leaves. On the soil the *Eriophyllum* dots the landscape with butter yellow throats.

I showed them how to place the well point—they have it in the creek where the cattle walk. But there is a good place up under the boulders where clean water seeps out. I think there’s a good place to obtain clean, uncontaminated water. Maybe they’ll do it. Until then I hope these new chlorine kits will suffice. They put a few granules of sodium hypochlorite in and then purge it with H2O2. Makes nice water.

Well, we turned and hiked back down, Dick and I talking about the upcoming five-year review of the reserve. Then, after letting the *Tantilla* go, we spent some time at Staples Ranch psyching out how to rebuild it.

Now I’m back in the BC after dinner and ready to go to bed. We shove off at 8:00 or so. I’ll pick up Phylly and will be off to home.

Steve Gliessman’s Journal

June 6, 1986

Grandview Campground, White Mountains, Inyo Co.

This morning as we all sat around talking about our unusual and off-the-wall “exploits,” I began to feel a certain unexplainable discomfort. It hung around into the morning as I was reading journals written on that jewel of an island we were a part of for a week. And then, as I read into one journal, something happened. One of you was having difficulty being with yourself, of being with the island, and took off into a several-day verbal dialogue with yourself, of why you are here and where you are going. This is something I’m sure all of you are asking yourselves as this Field Quarter experience reaches maturity. And as for many of you, your University experience begins to prepare its seeds for dispersal out into a very complicated and troubled world on one hand, and a very powerful and beautiful world on the other. This past 10 weeks, we’ve all been able to share and learn from this second side of our world.

We began with the wonderful calming nature of the Granite Mountains and the patient yet tenacious desert. We began to see the pattern and process in nature, shedding the weight we each had been carrying at home as we run our seemingly endless but necessary circles with ourselves. We began to feel each other, feel the sun and the wind, the plants and the animals, and especially the sand . . . I had to go under for 24 hours myself to shed some of that weight—weight that as a result, I got to see had really gotten to be too much. I realized change had to come, and soon.

Then you were off to Big Creek. I missed you all a lot that week, felt pulled away from the connection that had started to form, yet was able to deal with an altered perspective with all of those things I do in Santa Cruz. That process is really rolling for

me now, and I'm excited by what lies ahead. Yet, I needed yet another reminder of how my energy flows, and you experienced it very directly (my throat) on Santa Cruz Island.

Oh yes, the island . . . It was wonderful to share it with you. Did you feel that something special about it—that islandness? Weird, different, special—all sorts of different senses were awakened in all of you. Blue sky and blue ocean all around us. We were alone. Discomforting in some ways—very comforting that we can be alone in others! The plants (and animals) reached out and greeted us—showed us their uniqueness in many different ways. Each of us found ourselves in different ways too—under the green water of the pool, in the 30-ft. jump into it, on the beach that its water eventually flowed to, in the amazing wetness that the island seemed to have to generate that pool, or under the kelp forest surrounding us. I got to learn some new ways to “tell” you about it without so many words. Thanks for listening. A special, special place.

Then north we went, to the wonderful Smith River, on our way touched by the Douglas fir and greenness of the Nature Conservancy Reserve near Branscomb. Something I think touched us all as we explored with both Conservancy caretaker and part of the local heritage[?], what it means to preserve wild lands. That entire trip, apart from the beauty of the water, mountains, plants, and animals have awakened, strengthened, and intensified both our rage with what we see happening to our natural environment, and our determination to really have an impact on what happens from now on. Our manifesto expresses this so lucidly.

As you headed east on that trip, I headed even further east—to Detroit, carrying with me all of you and where we had been. A different forest—inner-city Detroit and the Kellogg Company, but similar processes—an urban environment crying out for help and seeing different ways people have decided that they will make a difference. Real compassion exists in our world, and I see it in all of you.

Together again, we traveled over the immense Sierra Nevada, so impressive that they seem surely capable of withstanding human onslaught and disregard—but we've learned otherwise, and look forward to changing that. Mono Lake was our resting spot for a few days—as it has been for centuries for all the migrating birds that count on her for refueling, nesting, or sustenance on their life journeys. And we learned how disregard for the rights of one part of our world for other values has placed an entire ecosystem on the brink of death. As we've learned this quarter, due to the interconnectedness of all things, eventually it will catch up. And we can no longer think that it will catch up so far into the future that it doesn't matter—we've had some important reminders during our 10 weeks—Libya, Chernobyl, Hardscrabble Creek, brine shrimp, a timber lease, a night call of the sawwhet owl, or snow melting on the mountains above our camp. And, it was especially meaningful for me to share Robbie with you all. She saw me with you, and she experienced all of you. And you will all be getting the official invitation to our September 7th celebration of life and loving in a few weeks. We hope some of you can be there, and I know all of you will be, no matter where you are.

Now we are here at our last stop on this special journey within the journey we are all on. Green against blue, merging through gray (or is that *Chrysothamnus* green?). The seed planted 10 weeks ago has sprouted, grown, flowered, gone to fruit, and produced yet more vigorous seed. The never-ending evolutionary process awaits you all, and the sweepstakes raft is ready to cast off!

So where did that discomfort I felt this morning (it's gone now) come from? I guess it was some inner realization that during those times we were talking about, that I had a lot of disregard for others around me. I was not aware of the impact I have on others, no matter what I do or how I act. I also know I needed to go through that time in order to learn—to learn to regard, to revere, to understand, to love. I also learned that I can (and have the responsibility to) have impact on what, and who is around me. It's like at this moment, by knowing this, I can complete with you all, and share with you the shift that happens as we go from disregard to full interconnection. And I learned a lot from each of you:

Michelle—sensitivity
Lisa C.—joyfulness
Diane—strength
Kim—delight
Joel—reaching out
Wyndham—lightness
Sara—commitment
Tom—eagerness
Eric—simplicity
Bethany—thoughtfulness
Hank—determination
Lisa K—growth
Chris—acceptance
Maria—delight
Susan—playfulness
Frances—expressiveness
Ann-Marie—openness
Peter—risk
Bill—dedication
Rebecca S.—warmth
Heidi—happiness
Rebecca W.—centeredness
Stuart—yearning

And Frank: another year to share this odyssey and give it away. You've done an amazing job, again.

And Ken: good friend, colleague, and teacher. You've done it again—been totally yourself and shown each one of us how to do the same.

I guess I feel a little like a plant does (!) when it lets its seeds go. Yet I feel mostly a surge of hope.

You'll do it—whatever you choose, and in this context of responsibility and commitment we've developed for each other and our wild lands.

You can do it
You really can
Let yourself do it.

A couple of favorite sayings:
It's not where you are going, it's why you are going there.

And remember:
the process of getting there is the quality of being there.

Thank you all, and carry a blessing from the god/goddess/all that is, we've been able to experience together.

June 6, 1986
Grandview Campground

Thoughts At the End of Field Quarter 1986

I've taken my chair up away from camp a couple of hundred yards where the voices of classmates have begun to lose their words. The babble now carries only the happy emotions of camp life, like squirrels chattering softly to each other as they bask in the sun at a burrow entrance.

My back is to the high mountain sun. There is a clarity and sharpness to its light as it warms my shoulders deliciously while my arms are still cool.

Down across the open slope, shingled with dull, brick-red Polita shale fragments, I can see the Sierra between gray-green pinons. The short section of ridge I can see is the Palisades Rim, where a tiny glacial fragment still hunkers in an north-facing cirque, now under a blanket of snow. Above, the ridge juts into the china-blue sky in jagged slabs and fins of pale purple.

As I settle to write, I hear a tapping behind me. I turn, and 50 ft. upslope I see a hairy woodpecker busily inspecting the bark of an old patriarchal pinon. The bird bobs this way and that, peering under slabs of bark, and now and then it probes with an authoritative rap. I'm surprised at how much force is involved. Fragments of bark fly and fall into the cuff. I thought I saw the bird catch some bark insect, and then pause, its long bill slanted up. What caught my attention most, though, is that the woodpecker backs down in a spiral around the tree as it searches, more than it moves upward. I see it use its stiff-pointed tail feathers as props in this curious locomotion. Then the bird hustles off, swooping with spaced wingbeats, to another tree upslope.

Light makes beauty here. The pinons are gray-green puffs of smoke against the blue sky. The buckwheat mats are handkerchiefs of palest greenish white scattered broadcast across the open spaces. Deep in the Great Basin sage clumps, the sun lights silvery bark and little tracts of tan soil while the deep recesses are black by contrast. Not so under the pinons where needle duff and fallen cones tinge the shade a rich brown.

I settle in my chair and begin to think about our times together. Our journey, I told you, would be a quest for the "wellsprings of caring about the land and its life." All of us would seek to know why these natural things were so obviously precious that many of us should seek to devote our lives to them in some fashion.

Why after all, should Susan and Peter choose to inject new levels of indignation into the rules I wrote about land stewardship? They too, I thought, must feel to the depths of their being care for this land.

I think there has been an unfolding of each of us going on during our journeys and it has centrally to do with this question.

We have searched in several distinct ways, I think. In one path we divided and classified and analyzed. This is a very human approach, I think, since we people divide and classify everything.

Here we've looked with the analytical tools of science, seeking pieces to our puzzle that one day we may reassemble to find understanding.

On a more visceral plane, we've shared the magic of water together, watching it run turquoise and amber in the still free eddies of the Smith, and felt it bubble and cascade, cool, across our fanning bodies in Wyman's Cleft.

We've looked with lilt and humor knowing that eyes are open when full of laughter. He or she who jokes, I feel, is not so filled with certitude as to be blinded, but instead is free to recognize the absurdities and inequities of our human world.

We've practiced looking with a child's eyes. The child has no pretense and we've sought to look without that particular scourge of adulthood. I think that he or she who can look with the wide eyes of a child also escapes the reductionist trap that leads down and down into less expansive realities until all chance of understanding the broader pulse of the world gutters out and disappears.

Those same wide child eyes lead us to love. We can now speak of the growing affection we feel for each other as each of us lets the others in.

Make no mistake about me, when I pat you on the shoulder or tell you how much I treasure your presence, or give you an embrace—it's no teacher's stratagem. It is because you are no longer mere members of the passing student parade, or mere names on forms. Each of you has emerged in vastly richer terms. Each of you has unfolded an utterly individual persona of worth and commitment, and each of you has somehow touched outstretched fingers with me.

This emergence has been of two sorts. One salutes your wonderful diversity and the other our commonality. The commonality is an almost wordless love of the world and its life.

We now search together, where at the beginning we did so alone. Just as we perceive our commonality of purpose we grow more accepting of each other's diversity. The poet, the artist, the teacher, the artist, and the scientist become equal partners in our seeking. Even our tools merge. The artist casts aside the mind's stereotypes in order to see and hence to draw, and so must, we find, the naturalist. The words of the poet must be selected with greatest care in order to capture the essence of things, and so must those of the aspiring botanist who would conquer Munz.

Even the music that has floated upward amid the smoke of our campfires carries with it emotional freight and access to wordless communication. We communicate on many levels at once and it speaks, most basically, I think, of bonding and reaffirmation.

Speaking of bonding, I must confess that in spite of your valiant efforts, I remain unbonded to lentils, those scurvy, sawdusty, flavorless little flying saucers from another lesser planet, and only lightly to tofu and yogurt; but then you can't win 'em all.

On everyone's tongues at many places in our wanderings has been that curious thing we call beauty. But maybe it would be better to call it a deep sense of rightness, of a world working by time-honored rules.

The silvered and decaying branch of a pinon is beautiful but it is also . . . [cut off]

Beauty—the mountain clasps me, as it does you, in its peace, touches me with its whispering wind freighted with desert incense, and in every fallen silvered stick, every cone, every shadow and every swooping bird, every musical stone clinking under my feet. I love this land and every other place we've been, to the deepest recesses of all that I am.

Science has revealed many of the beautiful things I know about it, the tiny worlds within worlds, plants and insects tied in evolutionary bonds, the magical senses of migrating steelhead, the subtleties of dolphin minds, the linkage of light, physics, and a lizard warming on a rock, the miraculous unfolding of a primrose, timed to meet its special moth.

Yet the power of these things stems from a broader view that encompasses them all, not their reductionist elegance.

It's when they become parts of a grander scheme that lets us listen with understanding to the silent ticking of the mountain that we find that our human cadences are inescapably linked.

That turf, we find, can hardly be seen through a single window. It is equally the property of the naturalist, the poet, the musician, and the teacher.

There is in short, not only a place for the diversity in each of us but a necessity that we pool our views to understand "the wellsprings of caring."

I love you all,

Ken

Joel Dunlap's Journal
June 6, 1986

Last Day

A bittersweet day. Like the lives of the plants and animals we've been watching. This quarter, this sharing, this love is ephemeral in its immediate expression but immortal in its memory, future, and new paths. This is the 44th day of our time together, and I know it's going to be missed, but I think we've all been touched in ways that won't fade so easily. I know I have, but if I had to tell you just how that feeling of being touched happened, I couldn't really put a finger on it. Part of it was learning. The plants and animals I've seen and come to know to some extent have taught me about life strategies, processes, and forms—some simpler than others, but all amazing in how truly complex they really are, with morphologies, physical laws, environmental pressures, biochemical processes, and whatever else entered into their creation and sustenance. It is also the sharing. Ken and Steve gave their life's passions to the telling of all these stories around us. Cosmo Joe and all the people of the group gave their particular inputs. But it was certainly no sacrifice for any of us. Whatever was given came back 25-fold. And most of that was in fun and really a genuine love that's developed. Time passed together with

both nature and people is also a large part of what this experience has been, too. There's a sort of knowing and feeling of closeness to another that only comes with time, and only comes with a sort of unthinking mind. Time passed is an accommodation too to comfort in and patience with what's around you. Time-spent knowledge co-evolves with facts and interactional knowledge that one gets from talking to a person or watching a plant. Fun has been a huge part of it. We seem to be naturally for having fun. Those that live with a sense of fun as a driving, sustaining force have a strong capacity for living and learning.

And so it ends soon with Bluebird of happiness flight back across Tioga Pass. But it won't pass badly. For gaining a piece of what makes life wonderful and full is never lost, and is exquisitely felt. The singing goes on even though the music may stop. And the world we entered for a quarter will be there, in the trees, water, and hearts, longer than most any of us know.

And so we all say farewell to a quarter that's been nothing but swell. Though the lizards will rest easy even though their stomachs are queasy now that we've stopped giving them hell.

April 13, 1987

Granite Mts., San Bernardino Co.

It's about bedtime on the first day at Granite Mts. for Field Quarter No. 13. The dinner is being cleared away. Guitar music floats in from the porch, where the clear cool light of the full moon lights the rocks and desert. Even so, lights twinkle from the 40-mile stretch of highway over by Goff.

We've had some nice soup and garlic bread and a good salad with wonderful dressing.

The fire burns down to embers and the three Coleman lamps wheeze and grow a bit dim.

The people emerge. Vibrant, tentative, wonderful, various. There are strong personalities, some of great simplicity and warmth, a struggling, preemptory one, and on and on. It unfolds and will take as long as we are together.

We saw Dr. Vandenberg today, and it was one of the best visions ever of the great Dr. V. We approached a roadblock manned by Caltrans people. One with his back to us held up his "stop" sign and as we slowed, he turned toward us—a fine white beard and mustache graced the face beneath the white plastic helmet. He waved and smiled and turned his sign to "slow" as we passed. He had hidden from us in his orange jumpsuit till the last moment and then turned. A hot tip, a good one, a few tricks, we decided.

I'm pooped and ready for bed. The flowers are scattered and patchy and not much is out at the BC.

Tomorrow we do "observation sessions" and a Frank Murphy trip to handle the plant communities.

Off to bed.

Observing

Not so easy as it seems to do it well.

1) The Gestalt—the baloney filter. Soak up the behavior wordlessly to form an idea of what really happens, against which to later test your questions. You'll come to know what questions make sense.

2) Right-brain Activity—Getting rid of or getting around templates. Going back to childhood before the templates formed.

3) Removing Yourself from the Equation—So many things that shut your eyes.

Physical discomfort (phenocrysts in gluteus)

Internal stress, mental unease.

Not being on mountain time—questions of pace. The pace of bugs, lizards, mice, whales, starfish.

Macho—turning inward. Nature is the authority.

4) Asking Questions—Spinning the Wheel

Experience, knowing what living things do.

Your experience.

5) Throwing-away Muscles

Must be as strong as those devoted to acquisition.

6) The Journal

Thinking out of the end of your pen.

Precise words.

Measuring words directly against reality—and memory.

Quantifying as a way of seeing.

Complete sentences. An indication that one is reading mountain time. Events in nature are complete, with subjects and predicates. When one uses telegraphic language one leaves out vital elements.

Proof: The step beyond seeing usually consists of proving it to others. Biology, being stochastic, requires numbers to describe it. The interrelation of everything.

April 14, 1987

Granite Mountains

Today I took out two observation groups; one to the S. and one to the N. The first wandered down the wash toward Floyd Dominy Dam. The day was moderately warm and rather few flowers were out, though we are told there is a good show over by Budweiser Wash. There is evidence of a considerable downpour here in bent-over willows down by Willow Spring, and by erosion of the river bed below the house. I suspect this was too recent to affect flowering here.

My first group looked at *Daphnia*, which we found in squirming aggregations at some places on the little stream issuing from Floyd Dominy Dam. It leaks underneath,

and I will have to go down with a shovel to see if I can find the exact source. My guess is it's leaking under the south limit. It should be rather easy to fix. We'll see. It is a splendid structure nonetheless.

Our *Daphnia* are amazing little critters—little valved animals with legs and antennae that can protrude. They can open or close the valves and protrude some sort of mouth parts to scour the surface of tiny sand grains that I suppose have accumulated algal films. Even though they suffered considerable predation from the larvae of _____ that was fairly common in the water, they seemed to show no evasive maneuvers at all. They seem to rely on the disparity of numbers, which was great. I wonder how long their life cycle is.

The other hike concerned aggregations of little dipterids over water at Cottonwood or Cove Spring. I found essentially random, evasive maneuvers. There too, with the lateral or horizontal dimension exaggerated. That is to say that the movement of individual flies wins. [??] dominant horizontal, but still possessed of random features.

We hiked back in the gathering dusk with a great smoky moon lined with blackish cloud strips.

I'm in front of a nice fire and will soon go to bed.

April 16, 1987

Granite Mountains

It's afternoon. the sun increasingly slips behind the ridge and the shadows of rocks and the cabin lengthen to the east. The heat dissipates as little cool breezes come from between the rocks. It's still parched and baking out on the bajada. Here on my bunk my only annoyance are swarms of gnats that seek out noses and eyes and exposed skin. A hat discourages most of them. Voices of students keying plants and discussing toads amplexing down by the dam drift in the window.

I'd been down there all morning tracing a leak in the new dam. Hot work, and I did find a place where water simply went under the dam. The old dam had not gone down to bedrock as advertised, but simply deep into the gravel in some places where the clay layers had been broken, and water just went down and under. I dug out quite a bit of the face and then ran the water away from the dam and down into the arroyo below.

I think a good trench, some more cement, and a little bentonite may make it all work.

Where the muddy water swirled slowly below the dam, I noticed little arcs of clear water and then could see a *Daphnia* at the head of the track. Close inspection on hands and knees in the muddy creek edge showed them to move through the opaque water, leaving behind a little clear wake. I presume the animal was filtering as it moved along. I watched to see if there was a cleaning maneuver for the filtration apparatus, but I never saw a clear example. Some of the traces were about 1-2 in. long before the little critter dipped out of sight into the murk.

Mosquito larvae left wonderful eddy swirls, alternating from side to side. The larvae popped to surface now and then, hooked to the surface and breathed, only to switch away in a swirl trace.

The class straggles in from various observation ventures and everyone chatters, photographs each other, shows bones collected from beneath an owl's roost, discusses

keying plants, stumbling over family names. Denise works happily in the midst on her presentation of mines of the area.

April 17, 1987

Granite Mountains

We're back from the dunes, and most of us are taking it easy in the afternoon heat. It's bright and still and hot, but up here in the cabin it's shady and breezes cool us, though gnats insist on landing if noses and eyes are left unguarded.

My skin feels nice from a dunk in the water trough that almost everybody shared. We had sand everywhere, and it grated in a sort of cosmic, full-body discomfort. To remove 95% of it in a single dip was bliss and then to stand on the granite apron near the pond and dry in the sun was to have been transported. That was followed by a nap and now people straggle upright and take up notes or other activities.

We left at dawn. Frank had quite miraculously mobilized us as the skin faded from pink to blue. We chattered over the washboard to the parking lot S. of the dunes and got out while the sand was still cool with night. The dune primrose (*Oenothera deltoides*) was scattered sparsely about, almost ethereal in its whiteness. I knelt to photograph one and then a dune *Astragalus* in bloom.

No umas were about at first. We did find a couple of sidewinder tracks, but they ended at burrows, and we did not see a snake.

It had been a still night. Marks were everywhere. Beetle tank tracks, compass marks of rice grass leaves on the sand, the humped lines of *Arenavaga*, and a track of a road-runner—big, sprawling feet, all claws and joints.

On we went up to the bivouac under the desert willow trees at the base of the main dune. There in the sparse shade we shed shoes and much other gear for the climb up the smooth arcing surfaces of immaculate sand above. I cautioned everyone to carry a pair of socks if they took off their shoes, knowing how fast the dark magnetite can heat to searing temperatures.

It was my 14th climb, and I was very unsure that I could make it because of my knees, but the pain and swelling had faded, and gave me no special trouble really. Just slog, slog, a step at a time. I counted 20 paces on the steep slopes and closed my mind in on them until I paused for breath. I've had harder assents for some reason and reached the crest pretty easily. I gathered the people around to listen to me talk about dunes, even though they were anxious to test the "booming."

I told them of the Tule Arroyo Dune, its wake, its way of moving and pointed out the venturi that I think exists at Kelso Dunes, aiding in forming them. Then everyone, or nearly everyone, stripped down and stood holding hands on the brink and jumped. They went sliding and rolling clear to the bottom and the mountain thrummed in its loud, deep voice. An ear put beneath the sand gave connection to the mountain itself that hummed so loudly it penetrated one's very soul it seemed. I could feel my head vibrate in the intensity of it.

I didn't slide for, being content to watch the others gambol and slide and cartwheel down, and then to struggle on hands and knees back up the 37 degree slope.

It has its magic, this dune and this rite of leveling together naked in the sun. There is trust and sheer animal pleasure, usually masked. There is the connection of brown bodies against the precise slope of the tan sand. The immaculate slope, the curves against

the flawless blue sky. It's a giant sandbox, too, to play in. It's open and it's safe. I made it clear that everyone could be his or herself and we had plenty of room, for no one to feel social pressure—and some just removed tops and one stayed behind, which we all respected without comment.

An almost visible tightening of the group resulted as it always seems to do; people were freer, they lounged more, with legs propped against the seats of the bus; they took their naps less self consciously and rapidly moved toward a cohesion and ease that begins to make this spring experience an odyssey from which all can look out, content that the group is there in support, in a land of gentility and support.

I always find this process a bit miraculous; especially the watching of personalities, hopes, fears, unfold.

Frank's off around the base of the mountain to tell Philippe that we want to go road riding tonight instead of sticking around for dinner.

Gerry Hillies and three congressional aides in the Land and Energy Committee of the Senate were here last night. This coincided with a fine presentation by our people on history and land use issues. The people liked it, I think. They were under some bombardment by Gerry about the upcoming Cranston Desert Parks Bill. One aide, named Tony, was a real kick—an older, pot-bellied guy with a sharp wit. He navigated his belly between the class members, saying, "Stand aside, woman and child." He announced that all congressional staffs were run by girls named Cathy or Pat and said the bill probably wouldn't make it this year because Pete Wilson hadn't co-endorsed it.

The discussion on the deck was good, solid stuff with enough of the tough issues emerging to make people think. I snuck a carne asada from Bob, the district manager's grill and later as the Colemans dwindled to one over diehard notetakers heads in the cabin, drifted off in the warm night [??].

April 19, 1987

Granite Mountains

Well, we made the loop to Hole-in-the-Wall and back uneventfully—nice weather, with the usual main events. It was hot down at Essex and at Cadiz, but even so, we found a fine old lady tortoise out on Kelbaker and all went well.

Then today I worked on Floyd Dominy Dam while Frank led another bunch up Cottonwood Gap to Granite Peak.

I had dug down along the dam pretty sure that we had a leak somewhere. The little stream below seemed to be fed from the dam somehow and by rights all water should have been pooled above the dam. Sure enough, I found a place where the old dam had not reached bedrock. I could almost stick my shovel under it right where water boiled through. So a crew and I trenched all along the inner face, finding only the one leak.

Philippe Cohen and Cindy Stead had brought the cement mixer and our five bags of cement. So we hauled all this down and Jim Keller, Tim Rush, Christine Fritz, Shannon Scott, and Andrea Nelson, and I started to dig and pour cement. Chris and Shannon became "mud maidens," preparing a slurry of clay to block pores in the gravel while the rest of us dug and cemented. The mud maidens decided to paint faces and legs with mud—bunnies in honor of Easter. I saw a picture in the making and ran back to get my camera. By the time I had returned another group had arrived, stripped, and were totally plastered with mud. I received an annointment—a Lincoln beard. I promptly put

them to work shoveling sand over the dam. They dug a respectable pit in a half hour or so. The patch may hold—time will tell.

That evening, the groups straggled in and finally only Joe Jordan and Mary Moreno were missing. It grew dark and still they didn't come. I walked the road calling to the cliffs with only echoes for an answer. Finally I decided at 10PM that Frank and I would head for Philippe's and contact the Sheriff's rescue team. Finally that time came. People had more and more realized the tenseness of the situation. Fortunately it was a fairly calm and not very cold night. Both Joe and Mary had worn only light clothes and had just a few things in a backpack. They had lagged behind Frank, who, though he had waited, never saw them.

Philippe called the Sheriff and after some waiting we got through and their emergency team was soon signed on to arrive at 3:00 AM, about a dozen of them. Frank and I drove back to find many of our crew up and waiting for news. I put them to work assembling a list of supplies for two of our teams. Frank would lead one, including Jim Keller, Rob F., and Karen Goodell. The other would be led by Tim Rush and would include Cindy Stedd (who knows the trails), Ingrid Booth, and Mack Travis. Two runners, Martin Skeper and Jim Scholland, would provide communication between camps. Gwen took charge of food and Tim Burnette assembled supplies. It was all done fast and with enormous goodwill and concern, as everyone thought of the two out there in the cold night, and perhaps hurt.

Fitfully we slept. About 3:00, on time, arrived a great crew of old boys with a full rig. They camped out in front of the B.C., a winking long line of lights in the yucca scrub.

I drifted off and somewhere near dawn, Joe appeared by my bunk and in a tentative voice told me Mary was in the bus, where they had laid out bags to beat the wind. I put my hand on his arm and could feel his tense muscled arm quake in the night chill. He was in a thin flannel shirt, an undershirt, and his shorts.

Joe and Mary had misjudged time and arrived off the plateau S. of the Monolith at dusk. They had tried to clamber down one of the boulder-choked feeder canyons and their flashlight gave out. Joe did it a step at a time, helping Mary down the big jumps by catching a dim glow as the flashlight charged. Mary had been tangled in catsclaw and had banged her head. Joe held her and rubbed her to bring warmth and she fell asleep for an hour and then they began again, finally emerging and hoofing it around the base of the mountain. Joe met the rescue team. They were elated not to have to call in the helicopter or to go up the mountains themselves. I roused myself to thank them, but by the time I made it down the hill many had left. I did express this to a couple of them and will write. It was a very comforting feeling having them there with their obvious professionalism and excellent equipment. They were specialists in mine rescues, having tripod gear to hoist people from vertical shafts. As Philippe put it one of them had a tonto complex, looking for footprints in all the washes, even though 29 students had tromped it all, and our people were almost certainly up the mountain.

About 5:00 AM, after I had drifted off again, Philippe burst in the Bunny Club door saying, "Ken, Ken, you want to see my injured owl?"

I was dazed with sleep and replied something like, "For Chrissakes Philippe, an injured owl at this hour?"

I stumbled out to see a barn owl wrapped in a blanket with a broken wing from gunshot. I could make it out in the dim light but soon enough went back to sleep. At last report it is hopping around Philippe and Cindy's living room and may make it.

Later in the morning I visited Joe and Mary in the bus. I gave them a hug and told them we were all elated by their safety and to stop worrying about feelings of guilt. They were cheered as they came up on deck and not a trace of recrimination had been heard. The group tightens.

April 20, 1987

Granite Mountains

We empty the outhouse today—another plastic experience. We also ran the great experiment with Karo syrup to see if waves go up a syrup stream to make it wiggle, or does the wiggle start at the top.

We set up a ladder and poured from roof height onto a great pancake cooked (and flipped) by Rob. We tried to see if putting a knife edge in a flowing syrup stream would propagate a wave back up the falling stream and we tried flowing syrup over a knife edge. Kate and [?] did this, and I thought it wiggled lots more, but the test was not definitive. The notion is that a waterfall flows over a knife edge and that it acts like a flute that induces a vibration in the column of water (or air).

I'm told that sometimes this can cause whipping of a waterfall and noise that can be quite overpowering.

The other relation is a Fronde number in which a ratio of rate of flow of the fluid (the syrup) is less than the wave propagation velocity in the fluid. A wave will travel up the fluid from below producing a series of nodes. The knife edge test also shows this. I must say my test was less than conclusive though it did offer a priceless photo opportunity and I thought Kate's knife edge had probably worked. The column did wave fairly widely. [Drawing]

A final note. We found that the Sheriff's Rescue Group thought our request might have been an Easter prank. They put together the following elements: Easter, Joseph and Mary lost, Mary's last name was Moreno, which means sheep, Joe's—which is Jordan. Well, I think they were relieved to find it was on the up and up, since some had driven all the way from Apple Valley 100 miles or more away.

June 2, 1987

Aquatic Res. Lab, Sierra Nevada, Mono County

We've invaded SNARL's new dorm, which is a grand stash for about 25 students. The food group is thrashing around trying to bake two potatoes for each of us (56 in all), mashing avocados, mixing salad, and making garlic bread. A royal feast, I say.

It's been a long, sometimes draggy day for me but I'm ending it on a high note just watching all the activity and camaraderie as this event unfolds.

Andrea is out tromping over the meadow outside the windows chanting a Beatles song. Marion is eviscerating avocados into guacamole. Several others construct salad and others of us write notes, play flutes, sip beers, sit crosslegged under the big windows, jagged Convict Peak jutting skyward. A gigantic moraine all but blocks the view.

This bunkhouse is a wonderful, functional stash. Dan Dawson has been a great guide. He took us up to Valentine Reserve nearby and lead a nice walk through its diversity. It is a small (150 acres more or less) place with a wonderful untouched meadow, a chaparral-covered hill, a lovely waterfall on Mammoth Creek, and a nice forest area of lodgepole pines, Jeffreys, and white and red fir. Down amongst the trees are cabins, nice log affairs with good stoves, bedrooms, etc. I think I'll contrive to have Phylly and me up here for a couple of weeks next summer to look at lupine sapphires.

June 6, 1987

Grandview Camp, White Mountains, Inyo Co.

Thoughts At the End of Field Quarter 1987

The mixed rain and hail sheets down outside the bus. Our windows are steamed opaque by our warmth. We sit lined up in our seats strumming guitars, writing, filling time. My fingers rub on the glass and clear a window to the outside. I see silver drops grow and fall from pinon needles onto the springy duff that grows ever darker with water.

We near the end of our long wander; most of the rest is going home, back over the Sawtooth "Range of Light," down across the ancient island arc basins and onto our wandering continental fragment that happened to dock at Monterey Bay.

Each of us has emerged in these last weeks, like a slide coming into focus. We were all cut-outs at the beginning, just names, positions, appearances—nothing more. The textures of warmth, wit, and care only unfolded with time. Now we can play in the mud together, or pass a laugh across a vacant desert road by jiggling each other's tummies with our heads. This is a wondrous thing, really. Twenty-eight remarkably diverse people finding that they can laugh, care, play like children, and see together. Down in their deep recesses people everywhere must be like that. In that possibility, which we made into a local capsule of reality, lies the hope of our world, both it seems for us and for the wild things of our world.

Yet in another sense we began different and we end different. For some, because of the clear space they now occupy, opening their eyes to the mountains, the clouds, and the bird song has been simple.

For others such "seeing" has been a more fitful thing. Their eyes and minds have sometimes been restrained by other imperatives. "Seeing," we find, is not so simple as I portrayed it at the Granites. There are more than phenocrysts where one decides to sit that can obscure vision. The buffeting of our lives, too, shapes the clear places through which we can see. Windows are fogged by more than the demand of our "creature selves."

The chatter and subtler concourse of our sociality demands so much of our attention that we come to treasure times of solitude, demand it even, to clear away the clutter of relationships, let our vision clear, let ourselves hear our own heartbeat and reach a simpler state.

But once alone it seems only inches away from those comforting, consuming words and laughter to the all-embracing impersonality of the mountains or the river, the vastness and austerity of the desert or out into the imponderable abyss of space.

In such a jaunt as ours, we have looped away from civilization and back again. We find ourselves pulled back as if on strings. We look for the assurance that our pack contains its flask of water, and a sandwich before going farther. Why should we bother to dare such times alone? Why not just surround ourselves wholly with the artifacts of our own making and with the members of our own kind. In other words, why try to be a “naturalist” at all?

Well, first there is beauty unlike in its perfection to anything contained in a city. It never fails to appear, on any mountain, in any wash, especially when one is alone and can see.

The fluted wood of a sleet-etched bristlecone trunk or the welling crystal water of Wyman Creek as it slides over a perfect pavement of amber, black, and tan pebbles has its counterparts in every naturescape.

Those things can reach deep into our emotional center, somehow in an ecstatic embrace together—we and the mountain. In the last analysis we then find that we are truly home.

Steve and Frank and I have made this curious assumption that atomistic analysis of the pieces of our world is not enough and that by looking together and at everything we could come to know the most important thing. In our long wander we have attempted to take in the natural world whole and examine it with group vision and collective intelligence.

In that attempt we say, are to be understood the connections that knit the world together, with us as a part. In it is the route to balance about how we deal with the world and with each other.

In fact, it is an article of faith with me that our only real chance of caring for both humankind and the world is to know both as well as we can possibly contrive. The world is simpler to see clearly than ourselves, I think.

“Know oneself, Know one’s world,” and then design accordingly. So armed with the best approximation to truth that one can devise, the path becomes possible, the naturalistic ethic will be shaped and we will perceive paths to guide us. Unarmed in this way, wrong turns prove to be ubiquitous and no sign corrects our mistakes.

So, my dear voyagers, our various journeys of seeing and understanding have just begun. I embrace you each, as precious new-won friends and fervently wish for each of you, in your own time and space, the continued pursuit of the vision, and of the gift of clear eyes and mind, with the clarity and simplicity of children, whose windows carry no film of vapor to obscure seeing the drops of rain falling from the gray-green needles.

With deep fondness and respect,
Ken Norris (sometime spam fairy)

April 11, 1988
Democrat Springs, Kern Co.

Field Quarter 14 landed here on the tanks of the Kern at about 5 PM, the day warm and still. Now dusk comes on and the sky light dims. I have my sleeping bag on the bank and am sitting in the quiet, listening to the murmur of voices. Everyone jumped in

immediately to cool off when we arrived. I'd guess it to be about 80 degrees F, still, and really quite lovely and calm. The gray-green river flows by in a very wide pool; above I can hear the riffle over on the opposite bank. People come together but still have much distance between them, especially the shy ones who still wander alone by five yards, or sit still on the sand, 15 ft. from the nearest busmate.

But the barriers fade fast.

We catch an ant lion larvae and watch it burrow seemingly faster than we can dig. I like the group; everybody seems centered and direct. I don't see the removed ones who can go either way—learn and experience more than everyone else, or disrupt.

The light fades, the creek shimmers dark and rippled, bright with sky light. I have my folding chair and sit on a sand bank at the river's edge. Not long ago I took a quick dip and emerged feeling clean, my skin smooth.

The ice is breaking; we come together and tomorrow we go off up the canyon, into the ecotone, the joshuas, the *Cercis*, and flannelbush, and then over Walker Pass and down onto the upper Mojave.

The year is inordinately dry. The winter rains quit very early and now brown swales show between the oaks and the spring flowers are fading fast. Pink clarkias poke from the hill slopes as we drive by and *Encelia farinosa* is in full yellow bloom. But most has gone by as summer comes early. What will its depths, in September, be like?

April 12, 1988

Granite Mountains

We drove down 395 through rather arid desert—desert gold gone by flooded between the bushes north of the Barstow road.

We got last food and stuff at Barstow, viewed three Vandenberg, and then headed out.

Dr. V. had a black streak in his beard, but one in front of Safeway had a pot belly, mumbled to himself, and stuck his cigarette in his ear—all good signs.

We arrived before dusk and got in and set up. Philippe and Cindy came in and then Roger Samuelson who had been fooled by a trick lock and had to walk in.

Everybody is wearing in nicely. Roger gave us a long technical/legal description of what it was like to put a reserve system together. I think it was generally well received.

April 15, 1988

Granite Mountains

Yesterday was raw and cold and from time to time it rained, sometimes pretty hard. The creek came up rapidly, at first muddy and then running clear.

A fine group went with me morning and afternoon, one looking at *Populus* leaves and one a *Penstemon*-like flower—*Keckiella*, which we described in detail in order to key it out. The last session grew rawer and rawer and when we quit I was close to chattering teeth.

At dusk we hit the cabin, dinner, and presentations.

I wrote a long, imaginative journey with Virginia Parrish. We became very small, walked among the crystals, rode in bubbles on the water, encountered yellowjackets and more. Great fun.

Then we snoozed off. This morning we took the circuit. The dunes were dark with rain and the clouds low over the land. After a nice hike in Hole-in-the-Wall we headed up the road just to the south and up toward the crest. We found a mountain capped with lava over whitish ash beds. We hiked up a brush-choked wash, the white float of opal (amorphous quartz) scattered in the wash. It began to rain and we were soaked before we got back. Low clouds scudded by as we clambered aboard the bus and headed to Essex, Cadiz, and home to the cabin before dusk. We had an electric discussion of land issues and how to protect the desert. A few songs and to bed.

April 16, 1988

Granite Mountains

Finally the rain broke through. When dawn came the sky was streaked with jet stream clouds in bands over the Providence Mts., and a veil of fog obscured the ridge. About noon the blue broke through and by afternoon it was clear and mostly warm.

Today was "Hike Granite Peak Day" for those who wanted an adventure. A fair number stuck around the cabin catching up on notes and sunning in the newfound sun.

Patty Lieberg, John Godino, and I decided to do some trail work on the plateau trail. We headed off on foot to Philippe and Cindy's place to get tools. This was a shovel, a mattock, and a pulaski. We walked the valley floor putting ties on bushes next to the trail and thence up the canyon in which the trail runs.

At first we just spruced up the trail here and there by rearranging rocks or brush but soon we reached the place where the trail crossed the creek again and started up the bouldery spine that leads up to the Oak Spring trail.

There we rearranged the trail in earnest, totally bypassing one especially bad spot and chopping our way through a big, scrambling catclaw bush. We cleared one long gentle bypass that is now a fine trail.

Patty whacked away at the offending bushes with a will and once I heard her say "Avast, you lily livered slime" and take a huge swing at a bush. Other emanations of this sort introduced me to a new side of this slim, quiet little gal. John chipped in with sterling banter and we had a generally good time, though as usual I pushed myself pretty hard and was thoroughly popped on the trail down.

Philippe offered me a thing I couldn't refuse—a shot of Grand Marnier and a hot bath complete with Rogers and Gallett soap. Boy it felt good. Back at camp I had a nice snooze and then Sandra McDouglas gave a very polished presentation on Australian environmental issues. She is very sharp, with a kind of cool judgment that made for a good presentation even though everybody was tired—off to bed.

Vaya Maria Padaskeva and My Big Adventure

Virginia Parrish nee Vaya Maria Padaskeva and I were walking down in a crystal valley. The way was hard. The right-angle, zig-zagging trail made us clamber over sharp, shiny shelves and to shinny down the opposite side, holding with the tips of our boots into the vitreous layers of pellucid glass.

High above us rose uncertain mirrors of stone as if we walked deep between towering skyscrapers on Fifth Avenue, New York.

Up there somewhere we could see patches of sky and scudding, swirling clouds. I poked my walking stick in the crevices to help me down, and Virginia, an agile sprite, skipped ahead and gave me a welcome hand when the drops became dangerous to jump.

We felt our way around a crystal angle and there ahead of us, curving across the sky, was an alabaster bridge of cleanest ivory, a vaulting arch that seemed to span the whole sky, just china blue and palest buff shadowed in long curves beneath.

We looked up in awe as we walked beneath the now-shadowed arch wondering when it began and where it ended. At one point, what looked like the fluted console of an ivory organ hung down from the arch. The floor on which we walked was now purest glass.

Curious spheres rose as high as Virginia's head on either side, as we carefully negotiated the slippery floor, the kaleidoscope of angles and drifting surfaces that surrounded us becoming curved forms in those spheres.

On we went, the floor now a rocky pavement stretching away as far as the eye could see.

"Virginia" I called querulously, because she was nearly out of sight ahead of me down the smooth slope. "Stop! The fog makes me lose my way."

She stopped and turned, waiting till I caught up.

Just then, coming from far off behind the crystal palisades, we heard an angry whine approaching rapidly, rising to a premonitory shriek of sound. Just in time she jerked my hand and pulled me under the canopy of great veined leaves beside the trail. We were no more than under it when the angry snarl materialized into an aerial craft that zigged and zagged this way and that, right over the trail on which we had just stood.

We lifted the leaf and looked warily out, hoping we would not be seen, but too curious even if it meant risking our lives to hide wholly out of sight.

What we saw gave us not a moment's peace. We quaked in fear and pulled back shuttering the leaf down over our heads just in time as the craft whined near, hovering just yards away in the air. We found a hole in the leaf and was able to watch, as though a porthole, at the awesome machine—a glittering, pentagonal, arching windscreen swung around, sending glancing showers of hexagonal light across the surrounding bushes and right over where we lay, momentarily blinding us in the flash. We thought we could see faces inside the windscreen and the yellow and black-patterned fusilage. And then, too fast to follow, it was gone.

At first we were too drained and frightened to move, but soon we realized the soil on which we had crouched was soaking with cold water that soon crept in and chilled us. Hearing no approaching whine, we began our journey again, listening fearfully for any returning hint of the craft's return.

Ahead now we saw a shining disc of still water, as shiny as glass. It stretched away and disappeared in the unsubstantial distance, merging into whispering, swirling fog that hinted of eerie shapes and forms behind.

Virginia skipped along at the water's edge, now blithe and unafraid, too intent on what lay ahead to remember our fear at the craft that had so shaken us moments before. I had to hurry to follow as she passed a rocky promontory to a place when the water was no longer calm but rippled with long, crystal waves that raced, curling and breaking on the shore. They were clear as glass and one could look through their curving, moving faces to see the varicolored rocks and little darting fish.

A great slabbed rocky headland loomed and when we first rounded it I saw Virginia stop abruptly, sheltering her gaze with her hands. Her head swept up in obvious awe, and then I saw them too.

Perfect curves of brilliant light arched toward the zenith, and as we moved, motes of rainbow light raced up the curves and out into space until we could see ourselves, little as ants walking toward ourselves. In moments we found ourselves against an insubstantial, wavering, dancing crystal wall that curved out of sight far above us, and into the distance on each side. A weaving flow poured down the curved glass and wove away beyond our sight, with tiny bubbles that were rafted and bobbing along, trapped in its swirls.

It seemed we could go no farther. "What do we do now, Ken?" Virginia asked, seeing our way blocked.

"I was just going to ask you," I replied.

Virginia poked her fist at the wall and it went right through, and so, miraculously, did Virginia, pulling her other arm in behind her. She stood on a glistening trampoline, a yard away.

Tentatively I made a fist and poked at the membrane and I too was enveloped for an instant and then inside.

We found ourselves in a focus of bright warm sunlight, the air utterly still around us. It felt wonderful to linger for a moment, but Virginia was soon off sliding on the slick floor, racing along feet first toward a distant glass wall. The floor began to slope up but she was moving too fast to stop and went right into it feet first. Just as she touched it, I heard an audible bang. The wall disappeared and far above us the dome quivered and shook in shimmering rainbow light.

Off to the side I saw a smaller dome only 10x as tall as our heads. We poked at the wall, and though it was tougher, we were soon inside and soon it began to spin while we propped ourselves against a wall, feet pointed toward the spinning center.

Our craft cut loose in the current and we found ourselves in a pliant crystal raft spinning and sluicing as swift as an arrow down a granite sluice, rocking and bobbing so steeply we nearly tunneled to the center.

In a moment we were aground, Virginia and I again in the open air walking up the gravel slope.

Only behind us was light, the sky ahead occluded by a black dome striped by an interdigitating double row of huge gold teeth. A dark mouth where the teeth were parted beckoned, and Virginia, fearless as ever, lept through into the darkness. The opposite wall was blue, radiating warmth and heaving slightly. From it came sonorous repetitive sounds like those of peaceful breathing.

I touched Virginia with my walking stick and we found ourselves in Laurie's tent pressed against the walls, the first tap tap of the afternoon's rain on the nylon.

Niche Hunts

Purpose: To perceive as well as one can in a day or two, one piece of the incredibly complex interacting system that is defined by the living things on any mountainside. It is a lesson in the use of the observation skills that you are honing.

Every plant and animal has its own special story of life; how it finds its nutrition, how it deals with the physical environment of light, heat, water, chemicals, how it deals with or uses other living neighbors.

Our job is, so to speak, to lift the tent flap a little and see how much we can perceive of one story in the limited time available to us.

From this we can hope to perceive something of the whole. We can imagine the complexities, the strategies, the intersections, in what I call not very precisely, *the silent ticking of the mountain*, or the collective ecological-physical-behavioral processes of the life and land together.

So what we are up to is the attempt to see into nature's processes both immediate and over evolutionary time.

How can we do it? Especially how can we do it in the short time available?

1. Be satisfied with little windows in the world of the organism and then predict or imagine the rest.
2. Find organisms that can be watched:
 Numerous or stand still. Don't pick fleeting rarities.
3. Plants are easiest for these reasons.
4. Animals are tougher because of fleetness, hiding, rarity. They tend to use much more space.
5. Find an abundant, easy to observe organism.

 Find out where it lives. This will tell you much about its tolerances, conditions of life, water, shelter, associates, etc.

 Walk around first and describe where you find it.

 What does the range mean? What is physical? What is social?

 How does it transport itself? Why?

6. Look at its form. (Munz as a way of seeing a plant)

 What does its form mean? Can you guess (hypothesis formation) why pubescence?

 Why funnel-shaped flowers?

 Why long flower stalks?

 Why are leaves shaped the way they are?

 Why is color used?

7. Dig it up—half or more of the plant is below the ground.

 Look at roots, tubers, interconnections.

8. Use your Observation Series as a way of seeing out of the end of your pen.

May 10, 1988

Upper Boronda Camp, Big Creek Reserve, Monterey Co.

I haven't written yet on this trip of Field Quarter '88, but the sun is dipping over the ridge and I'm almost alone in camp (David is here). The troops are scattered from one end of the north reserve to the other. With luck they will miraculously appear as dusk falls, and I can relax and listen to the music and general hubbub of 23 bubbling souls, all exchanging the many joys and experiences of the day.

It is cloudless and calm. The recent rains have the meadow green turning brown and the soil where my feet scuff at the edge of the camp table is moist.

The ambiance of the group is together on the things Don Usner and I set before them. This time the second niche hunt.

The first dawn at Redwood Camp went well though everyone is low key. The Santa Cruz Island trip was hectic and rushed—6 days and all feel it to a degree. It saps people's chance here a little. Even so some wonderful little vignettes accumulate.

An ouzel's nest down below the confluence drew a lot of attention. It was placed about 12 ft. above the swirling stream up a vertical face with few places a predator could climb.

The next, incongruously, was in the sun on a tiny ledge—a dome of moss, redwood twigs and other vegetation, with a funnel mouth pointed 30 deg. downward. Mother and father had to feed their three young on the wing.

Others looked at morning glories and though most energy was spent on the flowers, the revelations were in the stems. They had ribs that spiraled and hastate leaves that were on long pedicels that place each far out from the vine. The effect is that the vines can twist on themselves and on each other and can thereby become very strong, just as a rope does when its fibers are twisted.

Don tells me that his Datsun pickup stalled when a tangle of morning glory (*Calystegia*) became tangled with his drive shaft. He had to cut them loose before the car would start.

Just as we came into camp someone caught a beautiful mountain king snake. Soon Patty Lieberg had it in her hair and so did Carleton Eyester. Pictures, pictures—I hope they come out.

I spent the day trying to locate students to discuss their organisms. Jack Nelson goes his own independent way keying out and studying lupines. I found him wandering the open hills and then found Carleton and Erin out on the bluff tracking hummingbirds and Michael, David, and Cristi down in the creek trying to psych out miner's lettuce.

We stumbled through the key together but were unable to see anything very small for lack of a decent hand lens. My Swiss Army knife lens failed to reveal the ovarian details, I fear.

They straggle in, racing the dark. I'd guess half are here and we have half an hour of light, I'd guess. Worry. And it gets worse each year.

Don is concocting spaghetti. Evan Goldblatt just hiked in. The decibels go up. Fourteen here, and another nine to go.

Tomorrow we hike out, stop for nature notes and then hit the bus and home.

June 2, 1988
Grandview Campground, White Mts., Inyo Co.

Thoughts At the End of Field Quarter 1988

I sit upslope from camp, among the pinyons. My feet are dug into the warm, dark, pine needle duff. Out in the sun, beyond my circle of shade, the hill drops gently, a sensuous undulating slope covered by a mosaic of red tiles—fragments of the Polita shale.

These rocks reached the mountain surface in our tick of time, 580 million years after sand and silt first sifted over and buried them. Once below the surface they left living time and entered the almost timeless pavan of the earth itself. The mountain came to be under them and cradled their buried layers, and now holds them aloft for the winds and waters of the surface world to erode, split, fragment, powder and reencorporate as a future bookmark in the passage of earth time.

We are of that surface of course, and of its particular buffeting stream of time. Ours is in Gaia, the living terracious biosphere, where as one friend puts it, hyperstabilized DNA, the thing we call life, perpetuates itself, arranged in an endless stream of little statistical living packets encased in this or that body shell, moving, touching, shedding, engulfing, influencing in a probably fractile mosaic.

Sun streaming down warms and lulls me to a delicious lizard warmth. I curl on my gortex jacket, which I have cast on the needles. The win soughs over me, going uphill, the collective music of a million caresses upon needles and branches.

I place my cap and my face to shade out the sun and look upward to a thousand glittering drops of rainbow light striped black with Newton's Rings, wherever sunlight penetrates the weave. I move slightly this way and that, better to see the play of colors. Before I drift off I muse that life, I suspect, is no step at all away from the things and processes we call non-living. Our native Americans were deeply right when they propitiated the land and their prey before going hunting.

What, then, is this dance of ours? This pain, this love between us, these hopes of ours, why do we clasp and cherish each other so? And why, out here, is the mountain slope a palpable part of these events, as though the essence of life itself might slip out of our grasp if we turned away from it?

Why do we need to laugh and dance together here, man and woman filled with precious love and care, when these things seem so hard to achieve in our cities?

Because, I think, this mountain is true, as true as the tiles of rock spread before me that span all the years of metazoan life and now reenter its processes after that unimaginably long absence. and while we are on its slopes together, so in large measure have we become true as well.

That is the power of the mountain. Some part of sham and false paths have somehow been left behind for a time. This pervasive trueness touches everything we are and everything we do. While we are here, and we sense that we can learn the ways in time.

For instance, it seems utterly natural to run along a trail naked, or to play the glistening water of Wyman Creek through our dusty hair. We have somehow escaped into a new and infinitely precious space.

Escaped from what? Well, as a man three times the age of many of you, I am almost poignantly joyful to be playing amongst you, to share your vibrancy and new visions, and to feel the powerful sense of rightness you all, every one, share.

My years have filled me more with a sense of process than a certitude about the rightness of my perceptions. Too many times have I been painfully taught new truths by you for that. It is also fair to say that slowly, almost glacially, some patterns that connect have emerged, been tested, and still stand, as I, like you, have struggled for understanding.

These I lay amongst the Polita tiles as bookmarks to understanding that have helped me form my view of the world and how it works. Let me share some of these with you.

I have come to believe that the truth of the mountain is profound beyond any of our momentary understandings of "rightness." It, I perceive, plays out in the music of its wind, streambeds, and gray pinyons, a song that can tell us what to do if we listen, can tell us why we must love, and why we must walk lightly with the rivers, the streamside plants, and the mice that scurry down sagebrush tunnels.

It says, simply: Live by the rules of the land. You are no different or more special than any other part.

It says, Know that you are both men and women and that neither of you can understand all the rules of life alone. Only your collective perceptions encompass the world. Therefore, share and treasure each other for these two partly different ways of seeing, for there is no other route to the mountain's soul and the mountain's instructions. The keepers of the life force and of connection to the mountains (patterns through time) are different levels of the same rules, and they are not equally distributed amongst us.

It says, the mosaic of life is an endless turning and what matters to the earth is the process, the flow, just as it cares for rivers. Every part interlocks with every other part. The world, in fact, evolves as a whole, not as a group of disparate parts.

This says eschew those times and places where human arrogance would place the guidance of the earth in human hands. All who would tell you this, I think, are false prophets.

Instead, it says the guidance is collective and transcends any such arrogant pretense. The earth and its life is a watershed writ global.

It says, to a remarkable degree, the living earth is self-corrective, and such arrogance will be righted with utter surety. Somehow, the self-correction of the river and the earth have been captured in the processes of life itself and are found in every cell.

It says that the collective wisdom is as much held by the lupine on the hillside as by any one of us.

It says, most of all, seek to know yourself as a part of the larger world, in the deepest earth sense, for in no other way can you find the wisdom to act your proper role.

It says unless you come to know yourself you will always misstep and the earth will always correct you.

It says that death is part of life and that life is often profligate in anticipation of death. Only in the largest sense of Gaia, does life seem sacred to me, in the same sense that a watershed is.

It says the inner ring of life that stands bravely up to the impartial face of the mountain is what you can give to eachother in laughter, love, solace, and strength. No personal goal you can reach is as important as this.

It does not protect any of us from pain because pain is a part of life, and because we are ecological actors only in a collective ecological sense. Focused inward we typically fail to understand this. And though we may rant at the moon, it will not avail us.

So, I offer to you this. Always find a mountain and learn her rules, clasp her to you until you are one, savor the majesty and infinite economy of her process and pace. Love eachother and seek together because there is, indeed, no other way, so far as this old seeker can see.

I love you all,
Ken

July 11-12, 1989
Tanzania, Tarangire National Park, Arusha

We arrived in Nairobi three days ago very late, and because Alan's main suitcase didn't show up, we waited and waited, amidst that sinking feeling that it was lost with all the clothes except those he was wearing.

It was a long, long flight. Carrie was a bit under the weather. She slept almost all the way from Frankfurt where Alan's luggage presumably was lost.

There was a tense time aboard at Frankfurt when a woman accompanying two black folks didn't show, leaving her luggage on board (they thought), and we waited while they emptied the luggage bays.

Finally we were off to Nairobi and then to the gracious, elegant Hilton and finally to bed.

Next day was spent shopping, Alan making many arrangements, buying clothes, etc.

Nairobi is spanking clean with towers and banks and hotels. The city lies on a rolling plain dotted with trees and grassy fields.

It was refreshing to see equality in the eyes, posture, etc. of the blacks. They can be so elegant—much more beautiful than most whites, in my view. Here a whole middle class is arising. Many shopkeepers are, as always in this part of the world, East Indian.

We took an ancient taxi to dinner at the old Hotel Norwich a bit out from the city center and had a grand meal with a [?] of tables on a veranda. Most of the clientele was well-rigged out blacks; I'd guess we were in the 20% minority and yet it was wonderful and gracious. Why can't others, such as South Africans, understand how easy it would be for them to be the leaders instead of the pariah?

Off to bed. We took our first anti-malarial pills that we bought here—for chloroquin-resistant strains—a new drug called Paludrin. They are supposed to upset your stomach sometimes, and my notably tender gut responded by giving me a bit of a bad time all day today, but I'm hanging in there. It's supposed to get better in a couple of days.

Anyway, we drove south, out of Nairobi across undulating grassy plains studded here and there with flat-topped acacias.

The road is paved but has a great many sinkholes in it, and every village has murderous speedbumps to slow you down.

It was with great excitement that we began to sight large animals. Nubian asses were common and a few antelope. Then we came upon about six giraffes not far off the road. They are incredible beasts whose heads rear up into the canopy of the local trees. This is the Kenyan race and quite distinct we are told. Our driver was a knowledgeable young man who pointed out several mammals and birds and even knew most of the plants.

Soon the huge bulk of Kilimanjaro loomed through the clouds, streaked with snow.

Arusha, at the foot of a precipitous volcano, Mt. Mero, is an attractive, bustling town of more than 100,000, vegetated with large, tropical trees, silk oaks, tulip trees, big figs, and others, and a tumbling stream comes off the mountain slopes and through town.

We are at about 5,000 ft. and four degrees south of the Equator. It was a mellow 75-80 degrees F. I would guess. Clouds hung over the mountaintop.

We crossed the border at Namanza, traded vans. We drive in very nice upholstered vans and are whisked through most obstacles quickly. Namanza is a bit scruffy; one instantly sees the effects of prosperous Kenya and impoverished Tanzania.

The border was a "mass of Masai" women and men in traditional garb clustered around pushing this or that trinket on us. We weren't buying.

The Masai herdsmen, women, and children are everywhere along the road and out into the bush—each with a herd of cattle or goats, driving them slowly along with a long, knobbed stick (a fimbo). The men wear red plaid (mostly) or red-striped clothes over the shoulder wrapped around the neck, legs bare, with sandals or not, out there in the bush with the predators. The women wear many colors and mostly shawls are worn over their heads.

The knobbed sticks, I find, are symbols of respect for old men, and the long, unknobbed sticks sometimes spear-tipped carried by everyone are seen.

I wonder what it is like to herd cattle in lion country—which all of this seems to be—or goats? They seem so helpless, both stock and people, but they coexist in the same bush with the lions. But one wonders how many lions are left outside of the parks. That I don't know. A way south we turned east through polycultured corn and bush legume fields toward Tarangire Park.

On down the fairly good paved road we went until we came to the road into Tarangire Park. The park entrance is a nice kiosk staffed by smiling Tanzanians, and beyond the Baobab (bah oh bab) forest started. These colossal, obese trees dot the rolling plains and ravines. Great column-like trunks support a spreading corona of branches, some bedecked with pendant fruits. The trunks, many of them, must be 30-40 ft. in circumference. On most the outer bark has been stripped away by elephants in search of moisture. Some are burrowed clear through as elephants worried their way into the central, pith-like interior, often said to be full of water.

We made our way to the Tarangire Park Inn, which is quite spectacular. The buildings and tents are arranged on a bluff overlooking the sandy, winding Tarangire River. There is a gracious wood-trimmed bar and dining room, a pool and a couple of dozen big, two-cot tents with a porch, a bathroom, and shower. We occupied the first one next to the pool. Phyl and I lit up a mosquito coil to beat back the one or two who were in the tent, had a gracious drink with Alan and Carrie, then dinner and bed. That night the lion grunted, roared, and coughed in the night within a few yards of our tent. I heard him about 2 AM and think the assessment might have been correct.

Before all this happened we took a drive on the dirt roads of the park and were graced with many animals—10 to 15 or more times what one could expect on a similar American scene. Herds of lovely impalas, Grant's gazelles, and zebras were everywhere. Wildebeasts were also common—usually traveling with zebras. There was a kind of alley on each side of the road which was relatively animal-free and then lots and lots of them. I'd guess this animal-poor space at 15-20 yards in width or just enough to avoid intimate photos with my 210 mm. zoom. But a few wandered closer, and I clicked away happily.

Phyl and I enjoyed the ostrich, which were common, and we hadn't expected them at all. They are huge birds, weighing perhaps 200 lbs. The black and white males,

sporting pink legs and necks were courting the grey females with a kind of Australian crawl motion of their white plumed wings.

But I was a baobab man for sure. These curious trees silhouetted against the sunset were strange and beautiful. Film disappeared down the baobab hole.

We saw too many mammals and birds to discuss here. I'll just list them and talk about a few special events.

One bird of importance was, we learned from our driver Musa, the "physical shrike"—actually it's called a "fiscal." They are black and white, mockingbird-sized birds with very long tails that they fence back and forth with one another. It looked distinctly "physical" to us.

Then in the afternoon we watched from the veranda a quite wondrous scene. Down below us (we were high on a bluff) lay the winding sandy river. Its banks were grassy and sloped and dotted with acacias and other trees. Zebras flooded down over the bluff to a rolling place—hundreds of them. This rolling place is an open earth pan in which many zebras rolled. They spread out and one arm of the herd waded into the stream to drink. Soon we heard short barking, like a yappy dog. The barks came in pairs and I could make out different pitches in some. At the same time the zebras that were barking left the stream and began to flow back upslope in the grass. Soon enough we made out a lion drinking right where the zebras had been. Sectors of the herd yapped away in staccato fashion and one could see the zebras were alert—heads up and flowing away through the grass. Others farther away from the lion grazed unconcernedly. The constant attention of these predators doubtless begins to define the "circle of concern" and it ends quite close to the predator—it has to. The energy of flight can only be expended now and then. The same must be true of fear. It's very useful if it's always present.

At night one could hear the barking going on in various sectors. I suspect the pitch and cadence of the paired barks may carry information about the imminence of attack and its location. Perhaps even individual zebras are identified in these calls, so like spinner dolphin whistle choruses.

Musa, a fine driver, generally seems to have only modest sense about where a 2-wheel drive van should go. We came to a broad, sandy wash with steep banks on both sides. Obviously no place for us. "Shall we try it?" Musa asks. "No," says I—"it's an obvious trap." In we went and bogged down right in the middle. Much wood gathering, jacking, wheel spinning, and pushing later (after about two hours), and finally we emerged. We were, we found, about 1,000 yards from some park building, but we didn't know, and as Phyl and Carrie wandered up and down the wash, I had justifiable visions of lions, cheetahs, or what-have-you bursting out of the bush, not to mention upon us who were ministering to the car.

Then we came to a washout which we had to back around and were stuck again, this time with vultures in adjacent trees.

Tsetse flies are everywhere and bite like leopards. They easily penetrate most shirts, can fly 20 mph (so as to keep up with our open-topped van), and DEET sort of discourages them, but they search around until they find a clear spot and nail you.

We traveled with a huge Grant's zebra and wildebeast herd for a while, files of them rocketing across the road ahead of us.

In the afternoon light we came upon three elephants ambling along amid a few baobabs and in extensive grass savannah. The marks of their destruction are everywhere—branches ripped from trees, ones that had been tipped over, and of course the bark ripped from most baobabs and great holes excavated in them in the dry season. Right now the grass is deep here—often waist high, but we are told it is grazed nearly flat before the rains come again.

We sit in three tiers of seats in these safari vans—the tops push up and you can stand, elbows on the rim, and look out at animals within a few feet of your car.

Tarangire is a beautiful place and relatively little visited.

Another gracious meal, a time spent watching sunset come over the scene below us, to our tent, and then the sounds of night—hyenas and lions. Tomorrow we are up and off at eight to Lake Manyara and thence to the Serengeti, and then back to Ngorongoro, and then to Nairobi.

July 13, 1989

Tanzania, Lake Manyara Lodge

The road to Manyara is along the dusty slopes above saline Lake Manyara, which rests against the scarp of the Rift Valley. It goes through fields of corn and an unidentified legume, through dusty whitish lake-bottom soil and thence across the north end of the lake to a park on the west side of the lake right against the 1,000-ft. scarp of the Rift Valley.

Just before the park the dry, almost desert, land sharply gives away to gallery forest. At its edge is a nice village, whose Swahili name refers to mosquitos. I can believe it. Muddy ruts are roads. We turned off into the forest and soon came to the park entrance kiosk and museum. We all bought pins for our hats, the proceeds of which will go to conservation.

The road leads through the forest—all sorts of unidentified trees, vines, and such. Black-bottomed streams coursed through the dark forest and an occasional blue monkey was seen, an arboreal species with an inordinately long tail—1.5-2x as long as their bodies.

We soon came to a series of rookery trees, white with guano, housing cormorants, yellow-billed storks, and white pelicans. A [?] monitor bathed in a sunny patch alongside a stream, and I thought of Ray Cowles (my old professor who did his Ph.D. on this lizard species).

The dirt roads took us out into open scrubland dominated by acacias, palms, and broadleaf trees I couldn't identify. The place was tromped flat by the feet of animals—zebras, giraffes, warthogs, impalas, and troops of baboons between the clumps of vegetation. Alan spotted a dikdik (a tiny deer) and though we watched every tree limb for a sleeping leopard none came into view.

Reticulated giraffe were common, [?] down leaves in the brush, their knobbed heads often poking up over the general vegetation. We maneuvered to avoid falling in aardvark holes. There were a lot of elephant signs but no elephants, until the last when one refused to turn around for us.

The park is remarkably full of large animals, so full it's hard to see how they all subsist. The trees have their troubles too but they fight back with spines and inedible sap.

Musa, our driver, took us down the windy dirt paths to the hippopotamus pool at the lake edge. Almost all—about 30 or so, were piled on an island just across a narrow lagoon—an incredible heap of protoplasm. Giant, 4,000-lb. (I guess) animals leaned on or rolled against one another in the warm sun. Their skin is pinkish brown and one could see considerable scarring from their sharp front teeth. They are supposed to be very dangerous in the water but not on land. They are reported to be able to slice an attacking predator in two—so says Musa.

They do flap their ears and spin their tails and they do sweat pink sweat, as I had been led to believe before we arrived.

We had lunch under a thorn tree looking out over the flat, and then to the lake—a lone wildebeast stood head-down and forlorn at the lake edge.

Alan and Carrie are good traveling companions in every way. They know about personal space, and are full of interest in everything they see. Alan has interesting things to say about economics, foreign exchange problems, and the like.

Then in the late afternoon we retraced our track and out of the park, up the precipitous scarp to the Manyara Hotel (name is not exact)—a gracious place set right on the lip of the scarp. It ran out of water, with most rooms filled, but carried on bravely and we had it the next day.

From our window, we could see the length of Lake Manyara, and we could look down over the hippo pools we had visited earlier. About 20 hippos were piled on the far mud bank like so many elephant seals, mostly sleeping. Now and then one would amble over and lie down—plunk. Many were scarred, presumably from their razor-sharp incisors, which Musa says can slice an attacker in two. One or two swam, flicking ears. I saw some twirling their tails and even saw what I think was pink sweat.

July 14, 1989

Tanzania, Jeronera, Serengeti National Park

After breakfast in the extravagant dining room overlooking the pool and out over the rift valley and Lake Manyara, we drove off west toward Serengeti. The road goes over a highland bench dissected by shallow streamcourses and covered with maize fields, some of family size and some 1,000 acres in extent. At one point we came upon a troop of baboons ripping ripe corn ears off, munching as they ran along. Musa shouted at them, to no avail of course, as we drove by.

The road gradually wound up into the true highlands of Ngorongoro Crater, into cloud forest bedecked with Spanish moss and perhaps ferns and wreathed in fog. The road grew red and rutted from spring mud and finally we found ourselves on the crater rim looking down under the loud deck to the salty lake and the valley floor to the far rim perhaps five miles away . . . a helluva crater and a complete one.

How do you suppose *Hippopotamus* managed to get to the valley floor? (Later—my reading tells me that some hippos wander long distances over dry land—something like 1,000 km—so reaching new waterholes is part of the scheme.)

As we drove along the mountain we encountered many Masai, with their cloth raiment, their fimbo sticks, and sandals. Many were elegant, slim blacks with glossy skin and elegant features.

Musa spotted a group of four young men with walking sticks so I could bargain for one. I'm no bargainer and settled for 1,000 schillings (\$7), which was way overpriced

but worth it for the radiant smile that spread over owner Nilalai's face. He couldn't believe his luck. What I paid is some significant piece of his annual income. He'll be waving sticks at tourists for weeks. The stick is of hardwood of some kind, knobbed at one end and great for walking.

By the way, we'd tested a bottle of "dry red" Zimbabwean wine last night. It was hardly dry but fruity and fine if you called it something else.

At the Crater Lodge we passed the Grzmek monument—the two biologists instrumental in saving it through the Frankfurt Zoological Society. Michael, the younger, was killed in an air crash near here at a fairly young age.

The hills became drier and as we dropped to the plain, the terrain became parched and grazed within an inch of the surface, we are told by the passage of 100,000 wildebeasts on migration.

On the hill down we passed Masai moving camp—all strapped to burros, and all in traditional raiment, many with long lion spears. Down below in the grassy valley we could see their temporary camp of brush and brush huts where they bring their cattle in at night.

The acacias began to dominate—beautiful spreading umbrella acacias and little whistling thorn acacias with what look like 2-in. galls all over—each the home of a colony of guardian ants. The wind plays whistling notes with the ant holes, like blowing on an ocarina.

Finally we were into the foothills and to parched Olduvai Gorge so famous for human history. There is a nice little museum there with the story of 2.5 million years of human history back to *Australopithecus bosii* and *Zinganthropus* through *Homo habilis* and *H. erectus* through modern man.

One looks down from a lunch shelter to the gorge and its five beds. An intent black named Lucas, who shushed the neighbors who were intruding on his spiel, told us, very accurately I thought, the history of discovery from its beginnings with a German butterfly collector to the Leakys. He had taken part in recent digs. The name he said, came from Oldupai, the Masai name for a yucca-like plant—that was corrupted to Olduvai.

After lunch, on down the road we went and finally the grass began to deepen and the Thompson's and Grant's gazelles became more frequent. Finally, ahead of us a rocky hill loomed from the plain and well before it we came to the barren-looking gate to the park, like the entrance to a Texas Ranch, and then to the hill, named Naabi, where we checked in, went to the john, and picked up a young girl ranger, Tabitha, with a radiant, wall-to-wall smile. She said she could ride to Seronera with us (where we will stay). She knew a lot and told us about the cheetahs and lions at Naabi and other things.

The grass grew deeper and the antelopes even more abundant until they were to be seen in all directions in clusters, resting, grazing, walking slowly.

Surprising to me, we saw a good many antelopes, zebras, and wildebeasts, and others alone, often a long distance (maybe as much as 1,000 yards) from any group of animals, even close to dusk. This is surprising to me. I've never seen a dolphin that far from its school. I wonder if the extra dimension at sea accounts for this.

We reached the Seronera Wildlife Lodge. it was built around a kopji with many of the smooth granite boulders dramatically in the dining room and bar, with lovely views all around and varnished wood everywhere. Our rooms were nice with a good big

bathtub, and a view out onto the veldt. Giraffes and warthogs walked by and hyraxes were all over the rocks and almost in the dining room. They had flocks of cute little babies.

Our meals were wonderful, decadent affairs by huge picture windows as the sun set red over the flat-topped acacias. I was struggling with a stomach et al. irritated by the malaria pills we are taking (and probably our evening scotch), but managed to take in some sights [?] which Musa took us to see—a remarkable array of marvels—before we returned for dinner. The most exciting was the leopard. We drove down along a slow-moving stream lined with lovely flat-topped yellow fever trees, thence off on a barely visible trail through the knee-high grass toward an isolated sausage tree—nothing but trampled grass—then to another of the species. There, lying in the grass was a lovely and somewhat nervous leopard. We drove right up within four or five yards and were able to stand up and watch and photograph from this incredibly close distance. The shutter and our voices caused the cat to stir and I mused as I'm sure others did, that there was but a single bound between us.

What a sight, this great lithe cat, so beautiful, so powerful, so much on a hair trigger about how it should react to these infernal tourists, that cluster around; we so intrusive, blatant, and protected by the insubstantial oddity of our vehicle; so incomprehending really about this supple, powerful cat that could fell any one of us with a blow. But I clicked away, as fascinated as any at being able to invade its space. It was wild and we had somehow found a way to nullify its power, confuse it, challenge it into ineffectiveness, and then we nearly forget what it really was—we had almost, but not quite, trivialized it. But when we left, its patterns went on as they always had; this new element that had no place was forgotten, as the cat stalked and caught its prey as it always had.

As we clicked it pressed its head down, never leaving us out of its gaze, reacting slightly to the sounds we had made. I was glad when we left and glad we'd been there.

Dinner in the gracious dining room and then to a bath and bed. The water comes to the lodge from a borehole nine miles away. One houseboy told me the nearby water (1/3 mile) isn't fit to use even it from a well.

I went to bed with an uncertain stomach and planned to sleep in if a night's sleep didn't stabilize things.

July 15, 1989

Tanzania, Seronera Wildlife Lodge

It didn't really, so I opted to stay at the lodge while the others went off on a drive. I had a delicious sleep, photographed the lodge, the hyraxes, read *Sex as a Sublimation of Tennis*, wrote notes, and had half of a lomatil pill, which worked wonders. It stabilized the irritation I was experiencing from the malaria pill, scotch, or whatever, and soon I was back on track.

In the afternoon we went out about 3:30. Phyl reported all sorts of adventures with lions and other critters. Under the conditions, *Sex and Tennis* was what I needed.

In the afternoon I went with Musa to the hippo pool nearby. They are huge critters but stayed far away. Musa says they are amongst the most formidable of African beasts. They can, he says, slice an attacker in two with their blade-like incisors.

A few words about Musa. He is a rather slight East Indian, very dark, probably 40. He knows an amazing lot about the animals and nearly everything else here. Driving with him is like going on a whaling ship at sea. He knows many other drivers of tour vans. He stops and exchanges news with them. I sensed a quiet command from him. He seems sharper and quicker on the uptake than most. He steered us through every hitch easily (though he did get stuck from headlong driving, I thought). We learned later that he has not been to India, probably having spent his life in Africa. He has a wife and two kids eight and ten, and has been a tour guide for four years. He may be a "stringer," which is an independent operator who takes overflow from our tour company, Wildersun of Nairobi and Arusha.

After my brief and rather unsuccessful hippo foray, we picked up the others and took a long drive down along the watercourses lined with the lovely, open, yellow fever trees, where a variety of animal marvels awaited. Jaunty warhogs, the old male's faces featuring long "warts" and tusks. They ran off, tails up with a puff of black hair at the tip, like the [?] that dune buggy people use to avoid crashes as each comes up the opposite side of a dune. In this case I'll bet the hogs keep track of each other in deep grass as they avoid attack.

We saw our first topi, a big roan and bluish black antelope, and later found a pride of lazy lions in the grass alongside the stream. One female disdainfully refused to turn around even though we drove up 20 ft. in back of her. No amount of imprecation or animal sounds stirred her in the least.

Back at the hotel we had a leisurely dinner—the soup, a sort of dense miso, seems the same every day so far. Then tomatoes, coleslaw with carrots, sometimes plantains which are like very flavorful mashed potatoes, and a meat dish, and a light desert, three big Safari beers (a wonderful rich brown beer that we all loved), maybe a little fruit and then afterward we walk up between the boulders to the coffee, after-dinner drink room for coffee and look out over the darkening veldt where we could usually find antelopes or warhogs or a giraffe ambling along, and Marabon storks in the trees, then the dark and its sounds, a light here and there but mostly just bush and dark. In the morning the red sun came up through the trees just as we woke up and readied for the day's trip to Ngorongoro.

July 16, 1989

Ngorongoro Crater

Musa loaded us in his Nissan van—which has nice wide windows and a pop-up top which had been installed in Nairobi. We all could stand up and see out, photograph, and simply experience being within feet of a lion with nothing but air intervening.

Musa located an old male, regal in his mane, lying behind a low bush. He sank into the ground in utter relaxation as we stared at him. Vans began to gather and soon he was completely ringed with cars. Tourists pointed at him from every direction and he just slept. Musa, chuckling over it all, had us off to the side where I was able to photograph the tourist circle. We drove off, wondering what lion's life was like on the Serengeti. I guess off the tourist track it may be peaceful. After all, we tourists can only cover a tiny bit of the Serengeti.

Oh, I forgot to mention the promenade up to the restaurant that included an incline of smooth and varnished wood, I think polished everyday. You could walk up it

easily but you had to be careful not to slip. The little kids (and Alan) discovered instantly and we frequently found them running and sliding down amidst peals of laughter.

As we rode along the trees were left behind and the sea of grass began. A rather remarkable diversity of animals were there nonetheless. Herds of Thompson's and Grant's gazelles were passed and some larger antelopes. Furtive jackals and embarrassed hyenas were seen, the latter have little short tails, sloping backs and look back at you over their shoulders as they trot head down.

Soon we reached Naabi Hill and the gate and were out on short-grass veldt and thence past Olduvai and up the haunches of a great volcanic mountain to where the Masai people herded their zebu cattle. You saw them, often little boys, fimbo in hand, walking alongside 30 or 40 cows—to take them to the kraal of brush at night next to their temporary villages, which we could see on the canyon slopes beyond our rough dirt road. Musa negotiated between the largest checkholes but merely accelerated when the rocks were baseball sized.

It was on this hill that we met three secretary birds fairly close to the van and I was able to photograph them reasonably well. These long-legged hook-beaked birds must stand close to three feet high. They eat small things—lizards, snakes, cicadas, and the like, and pace through the grass with long liquid strides, darting their heads down now and then to catch a bit of food. Ours were disturbed by our proximity and partly flew, partly ran to alight light-footed as the gossamer condor, and then to glide away on broad, boldly patterned black-and-white wings. Their hawk-like heads sport a dozen long plumes that bounce along behind their heads like so many pencils over their ears. Maybe that's why they are called secretary birds.

Masai boys rigged out for the tourists burst from the bush, black faces painted with white maze patterns, and waving two long supply plumes from their heads. I'm sure they lure many a tourist to stop for "play for pay" photos. The other Masai men are almost all in red cloths slung over shoulders, long brown legs ending in sandals and clutching a fimbo—often crosswise across the shoulders or large end down as a walking stick or a cattle prod.

We were able to look over the hotel porch right down on our future tent camp, very much the dispelling the air of "outback adventure" of our future camp-out.

Not long after we entered the cloud forest and were soon at the Ngorongoro Wildlife Lodge, where we parked for lunch, served in the hotel which was set right on the precipitous rim of the five-mile crater.

We met our new driver, A. J. Olote, a smiling man from the Kilimanjaro area of Tanzania. He ensconced us in an almost new Land Rover and soon we were headed for the "down road."

Olote, as we called him, was a patient, careful driver and negotiated the rocky, awful road with aplomb. It took us down the dry western side of the crater past an open woodland of candelabra euphorbia trees and thence out on the crater floor. As soon as we reached the flats we passed through clusters of animals, streams of wildebeasts, graceful flowing herds of gazelles, clusters of ponderous, huge African buffalo, and herd after herd of Burchell's zebras.

The black and white "test patterns" of these zebras fascinate me. They should mask motion sense in an attacking predator—through something like flicker fusion. But I also wonder if they are especially useful at night when rod vision is in force and where

the black would be the absence of light and come to mask the contours of the animal. As the animal turned end-on, the black stripes might be especially useful in masking shape.

We rocked and bounced our way up into the yellow fever trees where an ancient old male elephant stumped ponderously around and then onto the slope before the crater wall where our camp was set, out there back of the stone ranger's house. We found our cook tent, a canvas shower, a canvas bathroom, a dining tent, and two big Coleman dome tents big enough to stand up in easily.

And up above 1,500 ft. was the façade of the cliff rim hotel, lights winking on.

Two camp helpers greeted us: Cristophoro the cook and Emmanuel, who served and generally took care of us. He was a deferent, gentle young man with only a modest collection of English words at his command.

Later . . . Such delicious decadence. Leapfrog scotch and wine at twilight, the moon sinking over the acacias and the waters of Lake Magabe behind when we finally came to dinner time.

[continued from above] As we reached the crater bottom, Olote took us on a long tour to the south limit of the crater. We saw so many mammals and birds it is hard to discuss them all, and I won't try. I'll just list them and discuss a few. We wended our way through the great herds of wildebeasts and zebras and came out on the grassy flat that edges into Lake Magabe—a soda lake that the Masai used to “salt” their cattle. They drive, [?] their cattle over the rim and down repeatedly during the year to provide salt this way. We could see their trails crisscrossing down the crater wall in many places.

Olote knew his animals and a great deal about the crater, but he had never heard of a whale, nor had Musa. Think of that!

After a short while on the road, we came upon 12 lions, females and cubs, lounging in the deep grass near a sluggish series of pools. The lions were every which way—upside-down tummies bare and paws folded, stretched out on their sides and only now and then did one sit up, or much less rise and walk a few steps to collapse like a sack of beans back into the grass again. They paid not the slightest heed to us but snoozed on. Olote said they had fed heavily and might lounge around up to five or six days if the meal had been big enough before going out after another.

Later when I made an estimate of a quarter of a million ungulates in the crater (or so); the nine or ten prides of lions in the crater could never dent the food supply.

Rather near the lions we came rather close to a lovely trio of crowned cranes—two adults and a young with just a few spokes on the crown. When they fly one can see the bright red through the black-and-white back and the graceful, light-winged flight as they stroke away across the sky.

Olote took us down to the water's edge of Lake Magabe where thousands of flamingos of two species stood in the shallow water, or swung their heads back and forth over the bottom, straining the algal film. To do this they hold their heads upside down like a reversed golf club. Out beyond they cluster in huge aggregations making clots of pink on the blue water.

We drove to near the water's edge and watched them a long time. A long file straggled by in front of us, the species mixed. On one side they hunkered down in the water splashing water over their backs and many took flight as they came closest to us. The greater African flamingo is a beautiful, but grotesquely slim bird standing perhaps five ft. tall, with big broad wings splotched with black and crimson. When it flies, its slim

and vine-like neck and heavy head are thrust forward in a sinuous curve and the long, long feet trail behind. The greater flamingo appears palest pink on its body until it flies when the deep colors are revealed. The lesser has beautiful pink body plumage and seems the more abundant and doubtless makes up most of those clots of pink we saw from a distance.

I'll leave rhinoceroses until tomorrow though we did see some this day out east of camp.

Even though my air mattress leaked and the tents were set on such a slope that we all threatened to slide out the tent door, the camp had an air of decadence about it. Drinks in the dusk, a bird calling insistently, and later the cough of a lion that paced near camp with nothing but the insubstantial presence of a ripstop nylon tent between us. Phylly, fearless as ever, made her way up to the canvas john when the call came before dawn, while I timorously did my thing in the grass alongside the tent, soiling the environment. As Ernest Thompson Seton said "Don't throw garbage near your camp. It draws bottle flies."

I suppose we had as much to fear from a badly navigated elephant as a lion, but what do I know?

July 17, 1989

Ngorongoro Crater Floor

We circumnavigated the lake today—a nice long, jouncy ride, but Olote was an excellent driver who never once threatened to rush into a swamp or a sand trap. At one time we followed a pride of lions through the grass. First we came upon the old boy, his great mane flowing. He was very visible above the grass and had almost no charge of real stealth in the daytime. Up perhaps 200 yards ahead of him we came upon the girls, down as low as the grass, flowing forward at a rather rapid pace. They stopped now and then and turned their heads quizzically our way and eyes turned toward us, and then went back to their movement. No prey was in sight and Olote said they were just traveling.

On we went, up over the "bottlecap" hill that was supposed to be the last of the eruption that formed the crater 2 million years ago, according to Olote. Over the grassy summit we bounded, in and out of 4-wheel and down the back side, where we encountered eight ostrich children, some of whom were from time to time doing the most exotic dance. Perhaps two separate groups danced around each other in the most light-footed, swirling, circling dance. Others were doing some of the rowing motion of the wings. All this followed a race down the hill by these jolly juveniles. I thought I could tell who would mature into a male and who a female but none were mature.

Down the bottlecap we went and out onto the grassy plain, where we encountered a bat-eared fox, sticking its head out of the communal burrow. To the north was the crater wall, its canyons choked with trees. On the east, water seems to be plentiful as long marshy areas, choked with sedges, finger out toward the lake and cause wide decorations of the road. One took us clear down to the lake shore. It must be all but impassable in the rainy season.

In one of these bogs. Olote called out "rhinoceros!" and there it was, a great, granite-gray lump all but buried in the sedges. It didn't do anything either. Olote told us about attempts to protect them from poachers and how a full time patrol is now involved, but still the numbers are now very low. Of course it is the aphrodisiac horn trade that

does it. There are only 15 rhinos left in the park, as a result, and few anywhere. Kriss[?] handles are another reason for the kill.

As we came toward camp we saw more—eight in all. One old boy was out in the open, his two sharp horns all in the clear. We circled him, obtaining a hatfull of slides. Then we saw seven more in deep grass, including a juvenile, praises be. One had the most enormous horns, long needle-like protuberances. Even though we could see ribs under their skin, they are essentially armor plated by thick skin and Olote said the lions can't touch them. The ones in the marsh were white with mud, but they are technically black rhinos, with an over-hanging upper lip and an expression like Randolph Churchill.

Another posh dinner in our tent, the bird still at it, the moon sinking over the acacia, the soft air, the crackle of charcoal under the toast, warm water in the little plastic basin to wash the face, and giant instars of some giant grasshopper in Carrie's pants, and off to bed, with lions chuffing about, and who knows what giant beast about to plant a foot on our tent, but we slept well. Fatalism sustained us through the night.

July 18, 1989

Kenya, Nairobi, Jacaranda Hotel

After breakfast in the crater, we loaded up our bags, leaving the boys to tend to camp (such decadence!), and off we went up the opposite road, right in back of camp. It was rough, but not especially steep and quickly took us up into trees, much more like cloud forest than the other road. It did climb a mighty steep scarp though, before it came out in the forest not far from the lodge where Musa waited for us. We transferred gear and off we went backtracking to the border where all went quickly enough except that one glassy eyed, big, sullen, customs man challenged Phylly's currency declaration and made her cough up all her U.S. cash. This required her to unbutton her blouse and open her money pouch and then to count out the bills (she came up short), and the customs agent impassively changed the total and off we went. Phylly handled it all with incredible aplomb and even thanked the custom's agent. What a woman!

We shifted vehicles to a posh Wildersun van and finally hit Nairobi gridlock, but our driver zinged through it as if he had done it ten times before, ending up at the Jacaranda Hotel, about 2/3 the price of the Hilton and very nice—nice restaurant, an attractive sit-down patio under the trees.

Off to bed to recover a little before heading for the airport tomorrow.

July 19, 1989

Capital Hotel, Lilongue, Malawi

We tumbled into an inadequate taxi and headed for Jonu Kenyatta Airport, bought food and booze, and then took off on Kenya Airlines. We didn't see much, a glimpse of Lake Victoria, and then clouds, and finally to a bumpy landing at Lilongue, Malawi.

We tried to arrange to pick up a car we had ordered (Alan had), and it didn't come and didn't come and finally we settled for a sedan and made our way toward town. The airport is architecturally modern and seemed efficient, which is more than I can say for the car rental agency.

We drove down a newly paved road and every half mile or so through an allee of tall flag poles (of wood) set on each side of the road, each bearing the Malawian flags fluttering in the breeze. There was a broad and neatly trimmed mall on either side of the

road planted with various tropical trees, some in flower. It went for miles. Ah, the values of authoritarian rule. Many things can be done that are difficult to do in other democratic cultures.

Rather soon we turned off to the Capital Hotel, which were our digs for the night while we tried to get our car rental straightened out. The hotel is posh—all wood, brick, rich plantings, each of us with a window garden, two restaurants, shops, etc. Our rooms were splendid, too.

We had a gracious dinner in the restaurant that didn't require a tie. I had cichlid from Lake Malawi—very nice fish—foot long fellows I'd say. Thence off to bed. We made it so far. It's cool and delicious here—70 degrees or so.

July 20, 1989

Malawi, Mizuzu, Rest House

Alan and I rounded up a 4x vehicle this morning after a relative minimum of fooling around. We drove to the agency headquarters and Alan dickered with the East Indian office man. We had two choices—a land rover with the top lifting off and a Nissan Patrol, with cracks in the rear windshield, 100,000 miles, and a spastic battery, and a headlight that winks on and off. But, it looked better than the Land Rover. We drove back, me in the sedan following, Alan ahead leading. It's all left side of the road stuff with roundabouts, and I was nervous but made it OK. Soon enough with Alan at the wheel we were off to the north.

We took the inland road that skirts the highlands since the land road is supposed to be awful. Our M1 was paved (mostly) and new and good and we zipped along through acacia scrublands and saw little villages with thatched roofs and schoolkids in blue. Many waved, especially the younger ones. The teenaged boys seldom did.

We stopped for lunch at Kasinga Rest House (More cichlids and chips for me), thence up the road to a detour into a little town where they pumped petrol in with a hand pump and the john was a concrete shelter with a hole in the center of the floor, thatched roof, etc. Alan is a sure, swift driver who has things under control. I was having the willies about driving on the wrong side of the road, mostly because I don't trust my reactions in a situation where I'm asked to react, instead of think.

The road took us through the forest on a dirt track in the red earth that was often rutted and difficult but toward dusk it took us to Mizuzu. As we climbed the plateau we entered huge gloomy plantations of a slim-needed pine and blue gum eucalyptus set so close together the trees excluded nearly all light at their bases. One looked down the close-set rows into a black box. These forests are huge, sprawling over hills and valleys as far as one can see. They were planted there about 30 years ago by the British for pulp wood and are now mature but have never been used except sporadically for timber and firewood.

After dusk we saw the winking lights of Mizura and soon entered town—I'm told of 25-30,000 people. We sought out the rest house (the sign was printed on one side and we came in on the blank side at first)—and finally up the rutty driveway to the place. We had signed up for two rooms and they were waiting—about 20 bucks apiece as calculated in kurachas, the local currency. Simple rooms with the facilities in adjacent rooms. We went off to the local hotel for dinner. I tried my first cassava bread—doughy, of good flavor, and more fish (I like fish). Then back to bed in the blowy, rainswept night.

July 21, 1989

Chelinda, Nyika National Park

We followed a good, paved road through scattered thatched-roofed villages to Rumpbi, a little town set in a foothill valley where we stopped at a gloriously clean gas station, where I had quite a conversation with a business-suit-clad gentleman—everyone speaks English—and then we were off, waving to smiling schoolkids in their blue clothes. Literacy is said to be high here. Gradually the road took us up into a short-tree forest and thence into deeper scrub. Phylly spotted two species at least of *Protea* in bloom—one a lovely pink one that lighted up the forest in many places. It seemed odd tromping off in the bush without being restrained (we hardly were allowed out of the car in Tanzania) to inspect this or that plant. No spitting cobra, however, got us.

Finally we arrived at Thazima Gate of the Nyika National Park, and were greeted by a gracious ranger who waved us in. We had to enter before 4:00 or the gates close, but we arrived about 2:00 PM.

We took the 4-wheel route up through the forest and saw remarkably few birds, one troop of baboons, and a reed buck. It was, in fact, impoverished.

About halfway along this track, which got very steep and rocky at times, we met a 2-wheel sedan out of commission, its front wheel suspension broken, a young man named Marsh and three dark women standing disconsolately by. They had dispatched the other car in their party for help, but we promised to take word to Chelinda for them, which we did, but I have scant confidence anybody did anything about it.

The forest was full of proteas so Phyl had a field day crawling around in the forest to see if there were new ones to be had. We saw some nice big purplish-blue melastomas in full bloom.

Not long afterward the terrain opened into rolling hills, entirely open and grassy. Much of the terrain had been burned to promote new growth. It looked like the Eastern Washington prairies, and we could see miles away into distant Zambia.

We saw our first roan antelopes—grotesque horsy antelopes, very large with long, pendant tails, heavy shoulders and heads and ridiculous ears that jut out like semaphore signals and seem to go all which way. The grassland was sprinkled with reed bucks, and we saw several. They are very like our deer except their horns curve forward. They frequent the open slopes, and we often saw them on the skyline. The animals are warier here than in Tanzania, probably from the ministrations of poachers whom we are told concentrate on the antelope and water buffalos for meat.

Finally our dirt road curved down off the rolling hills, past a dammed pond toward big groves of pulp wood pines into Chelinda. We drove up to the Park headquarters in a log cabin next to a “pickled-snake-in-a-bottle-museum.” After some cogitation we were checked into Chalet #4, and then we drove over to our new digs. It is a little four-room house set in the forest—a nice kitchen with a woodstove, two refrigerators, utensils, glassware, sinks, etc., a living room with a big fireplace, dining table, sofa, and chairs. I rushed in to start a fire because it is cold. To do this you have to unload the wood which fills the whole fireplace to the top. I made shavings and got it started, and then our houseboy, Peter Mtumbuka, came in and started all over, putting the wood back in and lit it. The wood is wet enough that it didn’t simply go up in a flash, but burned hot enough to heat the house all night. Live and learn.

Peter is a gentle, deferent man of Bantu extraction, reportedly a good cook.

Out back is a huge A-frame woodshed for logs from the local forest farm—pulp pine, mostly, and a water heater—a big, galvanized tank with piping set atop a wood furnace that belched flames and smoke when in full operation. It delivered steaming hot water to our bath and the kitchen.

Such grace in the wilderness—a good drink of scotch, wine from South Africa (a good white and nice cabernet) and then dinner cooked and served by Peter. The women, especially, loved it though I soaked it up too.

We checked out the village—a gas pump and general store, a school, dispensary, churches, and more. More than 100 park employees plus children lived there amid the pines, most in little, boxy, cube-like houses with almost no windows. It's chilly up here on the high plateau so wood fires are ubiquitous.

Back at our chateau we read till lights went out at 9 PM and headed for our nice beds, but not before gathering around the fireplace to warm backsides and listen to the night noises. A bush buck barked outside.

Carrie had heard about the possibility of going for a night drive for leopards, so it was arranged. At dusk we met a deep-voiced park employee, who it turned out was one of their poacher patrols, to take us out in our car on the roads around Chelinda. he told us about his job. He went to all parts of the park and sometimes into neighboring Zambia and was not allowed, outright, to shoot poachers unless they started a fracas, but to capture them and bring them back in cuffs and chains, whereupon they were fined and released. I don't know more, or how effective it all was. The poachers sought meat (buffalo and roan antelope especially) but also elephant tusks. He stayed out for 6-8 days and was a tracker.

Our drive turned up two leopards skulking along through the brush alongside the road. One was large and the other small. I saw the eyeshine and the forms. He said they were not dangerous to man but caught deer and smaller animals, as well as local chickens.

Back at the Chateau we wrote notes by the fire, had a little wine and scotch, and went off to baths and bed, with piping hot water in a great old bath tub in a cavernous bathroom. It's briskly cool.

July 22, 1989

Malawi, Chelinda, Chateau #4

Today we drove to the northernmost point reachable by road from Chelinda in the park—Jalawa Rock and overlook. We drove all day on the dirt roads of the park and never saw another car. The road, sometimes a challenge of rocks and gullies and sometimes smooth and easy, led us over the rolling open grassy hills, about half-blackened by recent fires. The newly burnt grass was just black but that burned earlier sprouted with new green growth and was frequented by many roan antelope and many more reed bucks. These latter have forward curving horns and are gray with white bellies and look very much like a deer. They were rather skittish and usually fled if we came within easy camera range.

The weather is worthy of note—here it is mid winter and days are crisp and sometimes the wind drops temperature to chilly levels—upper 40s, I'd guess. The sky is

dotted with cloud and often enough these drop low onto the rolling hills and we drive through mist. Now and then pairs or small groups of zebras were seen—a brownish cast differentiated them from those at Ngorongoro.

Our road led us north to a promontory of land where finally I pulled the car up off the black into the grass and we got out to hike toward an unseen distant point overlooking the northern lowlands of the park, where, we are told, one sometimes sees dozens of elephants and buffalos in the remotest part of the park.

As we walked the rutted road became a single trail and then the land became a rounded ridge and then a fin-like promontory and finally a sheer-walled pinnacle with sides dropping 1,000 ft. to the rampart-like hills and thence into a valley dotted with distant trees and laced with green watercourses.

The trail led us through grassy fields with scattered protea bushes and occasional copses of trees that I could not identify (except that many had the growth form of oaks and were either acacia-like or of families I couldn't recognize). The herbiage also had the growth form of grasslands in woodlands everywhere, but the players were mostly African natives: lion's tail (*Leonotis*), *Tradescantia*, *Tacoma*, and others I couldn't name. The fin narrowed and we walked its crest, the hill dropping off to a sheer cliff on each side. Finally we hiked up a steep shoulder to narrow ridge and thence to a ladder that took us up onto the ultimate point. We picked our way down between gneissic boulders to the point itself.

At first we could not see the valley below for the swirling clouds but finally they parted and we could see far down into the valley below—a thousand feet down and far away to where the acacias were dots on the brown-green landscape. Beside us on either side we looked apprehensively over the sheer cliffs and then nestled amongst the boulders, out of the wind, for our sandwiches and good Malawian Carlsberg beer. The clouds swirled in and around us blotting out the scene as we left, retracing our steps to the waiting car.

I piloted back up the dirt road to Domwe overlook; once again atop a steep scarp where we could look out into Zambia below—a river wound past little villages and we could even hear the waterfalls from our distant perch. Domwe was marked by a water-heater-shaped concrete monument and by very cold wind. We thought it was in the upper 40s or low 50s, so it was pleasant to ride off inside the car in the waning afternoon towards Chelinda, and to arrive at dusk at Chalet #4, where Peter had a fire going, our clothes cleaned and drying on a rack by the fire.

We all settled in for a little wine and scotch in a round of toasts to us and our adventure. Then followed conversations about this and that and off to bed to listen to the night sounds—the barking of the bush buck, black and white ravens, and owls. And, oh yes, as we came in, an African porcupine hurried ahead of us on the road, all his very long quills deployed toward us. Such magnificent rear guard protection.

We had driven in down between plantations of *Pinus patula* forests—a tall pine with almost silky pendant needles, four to a bundle. They had, we found, been planted 30 years ago by the colonial government for pulp wood and were now maturing. They are reportedly not very good for construction wood, though we saw many groves of Monterey pines as well, all planted in close rows so they they grow straight.

Animals we saw today included little groups of warthogs that run with their tails crooked (unlike those of Serengeti, who stick theirs straight up), a family of bush pigs—with smaller, shorter legs, and that flow close to the ground and disappear as if by magic.

I asked Peter about his religion—he sports a silver and ebony cross on his chest—and he said it was Roman Catholic and that there were two other sects at Chelinda—I didn't catch what they were. We saw the side-striped jackal a couple of times today, out in the rolling grasslands. They are handsome, very coyote-like dogs, with a darkish lateral strip on their otherwise tan-gray bodies. They are reportedly inoffensive and shy.

July 23, 1989

Chelinda

Today we decided to visit the “Junipers,” way off on the east side of the park where we could hope to look out off our high plain toward Livingstonia Falls and down toward Lake Malawi and then to Tanzania beyond. It was an overcast day, the cloud deck nestling on the high ridges as we drove off from Chelinda. The road took us first over long stretches of open rolling highland plateau and thence up on curving traverses into the fog.

Now and then, roan antelopes or reed bucks would materialize and bolt away into the mist. After a long time, but over better roads than most, Alan piloted us down out of the clouds to open valleys where we could see patches of what look like rain forest tucked in the folds of the streamcourses. We wondered if some of the taller trees we saw were junipers, but couldn't tell. Most trees were decked with beards of Spanish moss and prominent was a pinnate-leaved very green tree with reddish stringy bark. The basement granodiorite began to poke up through the meadows and finally we descended into a tree-choked valley and we could make sure of our first junipers—young, conical trees, like Christmas trees, at the edges of a tall gallery forest patch in which we could see ragged trees maybe 100 ft. tall that turned out to be old-growth juniper.

We parked at a little turn-around and soon a black man, shoeless with tattered clothes appeared and welcomed us. He led us over a little bridge and a swift brook, around a dense copse of trees to his cabin, where he and his companion lived, five or six days away from Chelinda, acting as interpreters and guides in the juniper forest. We didn't think we needed a guide, but he insisted we see the guest cabin and directed us down a forest trail. We emerged after 200-300 yards at a spare cabin set above the streamcourse. I unlocked the cabin so we could look in—two bunk beds, a stove, lanterns, Banda's picture; and then we settled in at an outdoor picnic table for a beer and then off to take the main trail to the forest. The brush was full of a plant that looked much like poison oak and since I had touched it I took pains to wash off in the creek.

We walked uphill and plunged at once into the gallery forest—only 200-300 hectares of it, but immediately a different world. The light filtered and dimmed and at once we begin to see the buttressed trunks of old tall junipers, lianas hanging down. *Dracaenas* and other deep forest understory plants filled areas where the canopy let in light. Soon we heard the chorusing of blue monkeys calling back and forth high in the trees.

We found a place at the base of a lightning-struck and burned juniper to sit and eat our sandwiches. Lianas as thick as my arm swayed slowly like bell ropes and up in the trees we could see clumps of orchids (Malawi is very rich in orchids). Our trail led us

first up the steep slope and then down in a circle. We passed many junipers 4-5 ft. through, with lovely cinnamon bark and trunks that shafted upward clean of branches for many feet. We passed many other trees we couldn't identify. We emerged into the surrounding grassy hillside, received a letter from the guard to his son at Chelinda and began the long drive back.

Not long after leaving the junipers we spotted a pair of elands, young and adult on the open hill. They are big antelopes with neck wattles and black spots on the backs of their front legs. We are told that in some places they mingle with cattle, which are near their size. Wary animals here as poachers seek them out.

Alan cut off on a side road to Kasarawba overlook. On the way we passed our biggest group of roan antelopes yet—perhaps 15-20. These almost comical animals are hunted here and wary. They pounded over the ridge and away across the grassy hills.

The trip back was long; reed bucks on the horizon, a family of bush pigs that simply disappeared, down to the forests of Chelinda, over the dammed ponds where, we are told, the planted rainbow trout lurks, and up to our wonderful, comfortable chalet where Peter had our laundry ready and dinner soon after. More good conversation and then to bed with the wind howling at times.

July 24, 1989

Malawi, Kasunga Guest House

I was at the wheel again as we left Peter, Chalet #4 with its leopards on the front picnic table (so we were told), and thence out onto the road that borders the Zambia side of the Park—through the Cholo—Forest, or so the map said—mostly *Brachystegia* sp.—a spreading, broadleaf tree that spreads like an acacia, with bark like a western oak. The road was one long red dust bath almost from end to end. We emerged with everything dusted—our hair, baggage, and car caked red. At the park border I turned the wheel over to Alan and we picked up a passenger, a young black gal who wanted off at Rumfi where the pavement begins and we were very glad to get off the washboard. Rumfi is set in a broad farming valley and a large turbid stream rushes through it. The surrounding hills are of granite domes (or inselbergs as the guidebooks tell us), baobabs and acacias, thatched farm houses, goats, and cattle with little boys behind driving them with a switch, broad schoolyards with floods of little kids and teenagers decked out in blue jackets but usually with short pants and sandals or no shoes at all. Gaggles of young women, many with babies on a sling over their back, trudged along as we dusted them in passing. This produced no noticeable change in either where they walked, or their temper. Everywhere we have gone we have been greeted with broad smiles if we smiled or waved, dances even; the little kids waved first much of the time. The men were usually more taciturn though it took little to get a rise out of them too. Very few man-woman couples were seen.

We stopped by the river for lunch and were treated to a vervet troop moving through the streamside tangle, eating selected branch-tip leaves, and to women in their usually colorful wraparound skirts, many with Banda's picture emblazoned across their anatomy.

The houses are small and round of mud and wattle or some of brick with grass thatched roofs that come to a peak. Granaries for cows are frequent and sometimes we

saw the village pump, women washing alongside greenish streams, usually several together discussing animatedly.

I drove after lunch, taking us through the road construction and the pulp wood forests to Mizuzu where we gassed up and Alan took over. We asked the Mizuzu Guest House people to call ahead for us but I doubt that they did. Even so if need had been we could have pounded the desk at Kasunga and demanded a room—but the inn was far from full as it turned out.

We sprayed our rooms with an aerosol pesticide called “Doom,” which listed a frightening agenda of chlorinated biphenyls and other goodies and listed dire warnings—but it slayed fleets of mosquitos and assured a comfortable night. Dinner was spare—chambo, fried potatoes, salad, and fruit cocktail out of a can. To bed with dogs in chorus in the spare forest.

July 25, 1989

Kudya Discovery Lodge, Liwonde

It will be good to change cars at Liwonde where we pick up a Peugeot station wagon. Our Nissan Patrol 4-wheel has seen better days; its battery threatens to quit at any moment, loses charge over night, I suppose from having the battery jounced over all these rough roads, and the windows leak exhaust—the back is of plastic, cracked, flexible, and threatens to depart momentarily, scaling off across the brush. But, to be fair, the motor is pretty good.

We retraced our steps to the capital at Lilongue and took in a little of the town including the government buildings—all the ministries—neat almost Indian-looking buildings on a well-manicured hill of many trees and flowering plants that looked generally clean and attractive. We gassed up, bought a few lunch goodies, and were off on the road south to Dedza and Liwonde. The population density grows to the south. We passed large villages of thatched houses—so soil-colored one had to look sharp to see them at first, into the Monadnock country near Dedza, advertised as the most beautiful in southern Africa—I thought that was overblown quite a bit—but interesting nonetheless. And thence near Dedza on the high plateau above the lower rift valley.

Little boys held out something for us to buy that we could not identify—it looked like half a dozen smoked rats between a forked stick, but just when we decided to stop for the next one, they gave out. I suspect they were smoked fish.

I was interested in the granite domes because here one cannot invoke glaciation to explain their shape. They look much like granite domes in the Sierra in shape though exfoliation sheet jointing is nearly absent. One does see an occasional spalled-off sheet but mostly they are smooth. So is such jointing caused by ice burden and relief when the ice leaves? Could it be differential cooling from the ice seeping in causing differential expansion and contraction? I wonder.

We stopped for lunch in a planted Monterey pine grove and as we sat there eating our peanut butter and Robertson’s marmalade sandwiches, sardines, and bread, a little gaggle of ragged children began to watch us. One little boy carried an even younger child. Momma picked dried ears of corn in a nearby field. I took some bread and the old peanut butter jar to offer the little boy. My attention frightened him and he turned to run away, but as I proffered the bread he turned back warily toward me, finally kneeling in

front of me, hands outstretched toward me. I gave him the treasures and he scuttled off to his father who had been working in the corn patch.

The road wound in the hills and began to descend toward the south end of the lake by the time we reached Ncheu, where people and stock and little schoolkids were all over the highway (they are in every town.) I turned the driving over to Alan at this point, and he took over in his usual competent way while I took a breather in the back seat with Phylly. Alan is much better than I at mastering the left side of the road stuff, especially in big towns, so I have tried to drive in the parks or in open country. Mozambique was on our right now with border points every now and then though the military presence and that of police is scarcely evident in Malawi.

Not long after we reached the lake level plain we came to Liwonde on the Shire River (Shir-e). We watched for signs and soon saw one advertising the Kudya Discovery Lodge and a short distance down a bumpy dirt road we turned into its gate—a scalloped, white-painted cement wall circled it and a big parking lot by the long, long string of rooms. Phyl and I and Alan and Carrie were on one end and to the right was the lodge—tiled entry area, dining room, a couple of bar-eating spaces with tiled floors and thatched roofs right at the edge of the river, clipped gardens, a swimming pool, boat launch area, and extensive lawn, which we learned the hippopotami kept closely clipped—amazingly close, in fact. I had no idea they could graze so well. There was a sign that said “Beware of Hippopotamus”—one, we found, was not supposed to wander around on these lawns because the hippos came out every night.

Phyl and I piled into our room. I “doomed” it to kill the abundant mosquitos and we went off for a pre-dinner nip of scotch and South African wine on the Strout’s front porch. We watched as the afternoon light faded over the Shire. It is a big, broad river (200 yards), lined with pampas grass and papyrus reeds and flowing smoothly but at a good clip.

Soon we noted people gathered next to the river and heard the pulsed snort of a hippo cruising 25 yards away in the river. They congregated each evening, we found, near the boat slip and then came out on the lawn. While we sipped excellent cold South African white wine we watched the hippos congregate, one pair mouthed each other noisily and another heard their snort and came in from 200 yards away, eyes above the surface all the way, swimming along like an express train. Apparently some social imperative was involved as the social equation became notably more complicated with his (we think it was a he—they can be larger) arrival.

I crept down with my flash camera and snuck along the cement wall until I was 25 ft. from them where I took several pictures that may or may not turn out as I left it on automatic instead of 1/60 second as I was supposed to do.

David Toft, our tour guide and arranger, showed up and we had a beer with him. Reminds me of an Aussie, though he is from Rhodesia—short sleeves, sandals, tan, outdoor type, 35, competent. He laid out our plans. He’s been a tobacco farmer and now a guide. He knows a lot about birds and game animals, understands business and how to deal with Malawi officials. He comes from Kenya where he lived on a farm.

That night I woke to hear clipping, like someone working a lawn edge with very sharp shears. I pulled the curtain carefully aside and there on our little patch of lawn (like Bermuda grass) was a hippo dipping along, not 20 feet from our door. They are low, stout

animals and this one reached $\frac{3}{4}$ way up the scalloped cement wall—three ft. or a bit more at the shoulder, I'd guess. I scrambled for my flash unit and grumbled trying to put it on in the dark. Phylly turned on the light to help and the hippo was gone in a flash—not an easy thing for such a bulky animal to do—but they can move. right through what I had been calling a hippo-proof gate.

July 26, 1989

Malawi, Liwonde National Park, Shire River, Mvuu Rondevaals

Kim and Dave were with us at breakfast. Kim, a pleasant, open-faced girl of about 30 took most of our luggage to our camp by 35 miles of jouncy dirt road, while Dave led us through the river by boat. Kim has done much of the logistics for us and is efficient, helpful, and very pleasant. I thought she might also be pregnant.

A barrage at Liwonde has backed the river up into a broad slow-moving stream, bordered by the grassy park lands of the forest and into some of the small tributary streams. The barrage is a series of adjustable gates that span the river and which can regulate flow according to the [?]¹—off in the river. Here it has created wonderful hippo habitat.

Dave took us down to his 18-ft. outboard (Merc)-powered speedboat, loaded us aboard, and barefoot, pushed us out into the river. He does not fear billharzia because it is slow moving and easy to treat and he gets tested once a year.

Right in front of the hotel the river is probably 300 yards wide and upstream toward Lake Magoda it divides now and then into various channels and marshlands.

Dave estimated there were 1,500 hippos in this piece of the river. Certainly one was seldom out of sight of them. The more I ask about them and see the more plausible an ancestral relative they make; on the vegetarian side of the equation to be sure. They show the following convergences:

- 1) Subdermal fatty layer
- 2) Scarrable skin
- 3) They blow on exhalation just like a whale. The spouts are explosive exhalations on surfacing from both nostrils that merge into a single, rather diffuse, upward jet of vapor in which it is hard to distinguish separate contributions of the nostrils.
- 4) When they swim fast they show vertical propulsive undulations of the trunk, and according to Dave, they are dangerous at this time.
- 5) Their calls, which Dave says they make through the open nostrils, sound like pulsed resonant grunts in which one can heard a slurred, clicked structure. These calls are given in air after the ears are flicked back and forth as if to empty them of water. Then they call. They call back and forth and respond with the ears in air. I have no evidence for underwater sound propagation, but I expect there is some component and it ought to propagate well. Can the hippos hear it?

Hippos are reported to graze with their horny lips, not their teeth. The teeth or tusks are reportedly very sharp slicing weapons of awesome capability. Dave thought the hippos tucked the hindlegs forward when swimming fast, but he wasn't sure. They swim rapidly underwater leaving a bow wave over their heads.

As we went up river in the open boat, we met many interesting birds. The white-breasted cormorants roost in riverside trees in great numbers, painting the leaves white until growth is stunted and the trees die. Several dozen trees near the river were so affected and housed hundreds of garrulous cormorants who streamed in from Lake Magabe near dusk.

Dave drove us up a little, slow-moving stream that enters the Shire. Malachite kingfishers are little, extravagant, metallic-green birds, red and speckled—very small. We saw the big brown Hammarkopfs, who nest for a very long time and keep building a messy pile of sticks up in their tree.

Dave brought along some cichlids and stopped to pick up a floating plant which he divided and stuffed in the gills of each fish so they would float.

Soon we came upon two regal-looking fish eagles perched atop dead palms or branched trees at the water's edge. They are elegant, black-and-white-headed birds with a rusty cast to their backs, probably about the same size as our bald eagle. Maybe the two are variants through this one is the more beautiful.

Dave gave a great whistle and tossed a fish 40 ft. out from the boat. The eagle swooped from its perch, and faster than I could track through the viewfinder of my camera, plucked the fish from the water and was wheeling back to his perch to pick it apart.

Only when I looked over the top of the camera did I come close to catching the moment when the eagle plucked the fish from the water. We'll see.

After that we passed a point where cormorants nested and Dave said we would see crocodiles. Sure enough, big (perhaps 8-10 ft.) crocodiles were there sunning. When they saw us 50 yards away they walked and slithered into the vegetation-choked water and disappeared. I guess there were 4-5.

Then we passed close to a cut bank where Dave pointed out the little circular bore holes—maybe 2 in. or a little more in diameter, which were the homes of pretty black and white pied kingfishers.

We cruised on over glassy water, stopping to look at some elegant water lilies; then because the sun had grown a little warm, up went the [?] top and out came a cooler of cold beer and soft drinks as we drifted the lovely papyrus-lined river. Such a scene, such big gulps of life! Just like we owned the place.

The Shire is not very clear, but greenish and roily, which fits the scene. We poked our bow into the reeds where Dave had seen some water bucks. They are gray and have a perfect white circle, perhaps a bit longer in radius than their tails, which swings in the middle like the hand on a clock; and boy, do they swing their tails. I'm sure it's some sort of signaling pattern but need to see them in flight to see what they do with their tails. I suspect they may be staggered in flight or follow in file.

We saw several lily trotters or jacamas, my first view of these incredibly long-toed birds. They literally trot on lilies, white and brown, and a bit flighty.

The grassy fields often to the water's edge were punctuated by tall *Borassus* fan palms—tall trunks and a puff of fronds. Some had a swelling $\frac{3}{4}$ of the way up the trunk, and we were told this developed just before the tree began to flower at about 40 years of age. It looks for all the world like the swelling on our *Eriogonum inflatum* stalks—and may serve the same function—dissuading unwanted visitors to the flowers or seeds—rats in the case of the palm probably, and beetles for the buckwheat.

Dave said the water that had been backed up by the barrage and was killing those whose roots were constantly in water. But the broad river formed a very important, protected spawning ground for the chambo who migrated up into it.

We soon pulled up to Mvuu forest camp in the National Park, which is a series of four or five brick rondaveals—circular, thatched buildings maybe 20 ft. in diameter. The four of us occupied the two rooms and two johns of each. We had two mosquito-netted bunks on each side [drawing of building].

Lunch was served in a nice, open lunch verandah next to the river. Kim produced a fine lunch, and then we were off in the boat again, this time out of the Shire and into the lower end of Lake Mulombe. The afternoon wore on, the light turned pink over the distant mountains and colored the trees and rushes.

As we left I could hear antiphonal music, a counterpoint of voices and rhythms from the camp on shore and soon we saw a great bonfire flicker and flare.

Dave had a secret place to show us and landed on a reedy bank, jumped ashore, and bade us do the same. We carried our drinks ashore and there ahead of us was the most amazing baobab, almost entirely clasped by the roots of a strangler and a sycamore fig tree. He led the way to a little door that let the slimmer ones squeeze inside (Phyl and I merely looked inside).

The sun set now, casting rose over the Shire, and silhouetted the reeds against the water. A lovely scene. Soon came a clinking chorus of little frogs—like tapping a spoon against crystal. Dave showed us the Moma tree which provides a cheap drink to elephants when they eat the seeds.

Back on the water we skimmed in the almost black back to Mvuu, its snorting hippos and a nice dinner that Kim was preparing. She barbecued chicken on an outdoor charcoal grill set midway between the cormorant roost and the place where the hippopotamus roared.

The Strouts and Norrises had their ceremonial scotch and wine and a beer with the Tofts around dinner. They were a little defferent and had to be invited to share with us.

Talk wandered to Dave and Kim's lives. She was raised on a farm in Zimbabwe and allowed that things stabilized after the blacks took over. He was from Kenya where Dave's father ran an outback ranch where they cooked with hippo oil—the best he said. He'd emigrated to Zimbabwe and had served four years in their army and tracked across the border into surrounding countries. You can understand why he is so at ease in the bush.

Phyl and I retreated not long after to our Rondevaal., its mosquito bars and dark cold-water john, where we listened to night noises. But first we trotted off with the rest to seek a hippo who had decided to wander through camp in search of grass. Risky, I thought, but no one else seemed worried as we stumped around in the dark with inadequate flashlight beams playing on rows of impala eyes, and the squat shape of the hippos sliding through the bush.

July 27, 1989

Malawi, Liwonde, Discovery Lodge

This morning we went for a 3-4 km walk in the bush near camp. We were accompanied by a handsome, lithe guide, Benson Gondwe, who walked with the grace of an antelope, his ancient Senfield 3006 crooked on his arm. Dave most often flanked us,

out alone in the scrub, both of them spotted animals well before we saw them. The dust of the trails was covered with tracks, the knuckles-down tracks of baboons, serval cats, impala prints, and once the trail of a lion.

We were in Mapone woodland with baobabs, palms, acacia-like trees, and the remarkable python vine—like a giant wisteria—great, hauser-like vines, twisted around each other like snakes and around and up into large trees.

The impala lily (*Adenium obesum*) was in bloom, lovely rich pink and white trumpets springing from fat leafless branches near the soil.

I took a couple of pictures for Phyl who was quite entranced with them.

We came upon three or four shallow brown waterholes, some choked with water plants and others of open water. We sat down under a tree alongside one and waited while birds flew in, and come in they did. Flocks of fast-flying peach-faced love birds settled along the water's edge and skittishly took to the air at our slightest movement. The gray-hooded kingfisher darted in and off in a nearby bush. We saw the crested form and long tail of the "gray go-away bird," a name supposedly related to its call. We were all sorry it wasn't the "bare-faced go-away bird" but it lives to the north in Tanzania and Kenya.

Dancing herds of lovely impalas started at our coming. We saw groups of half a dozen horned males down the forest lanes, bolting and stopping stock still while they tried to make us out, and later we came upon a flowing herd of maybe 30 or more females accompanied by two males flowing through an open meadow.

A little later we crossed two hippo highways, trenched footpaths that these huge animals use at night when they come to graze. We sighted greater kudus off in the bush—amongst the biggest of the antelopes—three does and a buck—and then they were gone.

The trail reached the road that led to the camp and we began to trek across wide, grassy fields with the sun beating down by then. It became a hot hike by the time we ducked into the shade and reached a cold beer at the tables overlooking the green Shire.

The gun had been to dissuade irritable elephants from taking umbrage at our invasion and possible lions, but our guides were taking it all calmly enough. I have observed "escape distance" behaviors in Dave though. He gives hippos considerable berth and even more to crocodiles, I thought.

After a nice lunch we said goodbye to Kim who goes by road again with our luggage, and we returned to the river in a vain attempt to sight a fishing owl in its daytime tree. Then we took off down the river toward the Discovery Inn. Dave took me past two dozen hippos while I tried to photograph a blow, and then he spotted a considerable herd of elephants, including two engaged in a ponderous shoving match—a slow-motion affair in which one frequently pranged its tusks in the rear end of the other.

Dave beached the boat in a little narrow channel and even went a short distance on shore towards a mother-calf pair grazing 75 yards away. I must say this made me a little nervous as there was no way we could have moved very fast out of the tight winding channel, but I guess Dave knew what he was doing.

Soon enough we were at the lodge again and stashed in rooms, this time widely spread. We paid Dave, and took his and Kim's address. A good show and very nice people and wonderful to be out of a car on our own.

July 28, 1989

Malawi, Livingstonia Beach Hotel

We traded in the Nissan gratefully for a Peugeot station wagon. The Nissan's battery died outright, I believe, and we were relieved to have a tighter car that didn't admit as much dust. Soon enough we found the back doors both lock when you are inside and these passengers had to be "released" from outside at every stop. And, Alan pointed out that the key was almost broken through. It also had 210,000 miles on it and some very slim tread indeed. But, it was a lot more comfortable and piped in no exhaust.

We headed south toward the old Colonial capital of Zomba, at the base of the Zomba plateau, maybe 35-40,000 people. We immediately loved the place—it is set in hilly, tree-shaded country, high enough to be cool. The people were very friendly and even the street vendors remarkably non-pushy. We bought wine, some more malaria pills (so we will have enough to taper off when we get home), bread and cheese, and Phyl went to the bank for a few Kuacha.

Soon we spotted the village outdoor market. It occupied a whole shaded block and was a remarkably colorful, interesting, and clean place. The women dressed in bright-colored clothes and the fruits and tomatoes made long swatches of red and yellow between their colorful promenades. There were tin-smiths banging away, basket-makers, pottery, long tables of dried and smoked fish, and much more. Alan had to pull us away. I took a lot of wide-angle, surreptitious photos. I could just set the focus and adjust the shutter speed once and then snap away without disturbing anyone. Only one woman seemed to notice what I was doing. Such faces, such clothes, the little children, the color, the sculptured and stooped old men, the bustle, the chiseled bodies of the workers excavating a new wall, the women's faces as they fondled their children.

Off we went up a long, narrow, winding road toward the highland-forested (farms of trees) Zomba plateau. Soon we could look down on the town through tall eucalyptus trunks, *Dracaena*, acacias, and many broadleaf trees I couldn't identify. I didn't know it but the road was half of a one-way loop. I kept thanking my stars that we didn't meet anyone.

At a promontory close to the top we came upon a delightful inn with a verandah terrace below the hotel that hung on the mountain and looked out through the twisted arms of *Brachystegia* trees to the valley and Zomba, hazy and smoky far below. We stopped for coffee and were served great steaming pots—twice more than we needed, before driving down the "out" road. Once in the valley again, we headed for Lake Malawi shore.

Soon we were among the thatched roof villages again, hard-packed dirt, granaries of wicker often set up above the ground (and presumably above the rats). Baobabs returned, fallow cotton fields, cassava and many, many people, on the roads, working slowly, or just lolling around talking. School was out and we encountered a flood of children in blue.

We stopped for lunch at Nkopolo Lodge and the nearby Leisure Center (where we actually ate). The lodge was posh, gardens, a truly lovely lakefront dining room of wood tables and elegant pale blue and white linen.

But we had our own bread and cheese so off we went to the leisure center where by dint of buying a beer all around we commanded a table by the beach under a thatched parasol. Pretty posh. I had a Carlsberg stout—grand stuff if you like it.

Along toward late afternoon we signed in at the Livingstonia Grand Hotel—equally elegant and with an old colonial history. Pictures of Livingston, his wife and topi-shielded men in puttees lounging on the porch being served drinks.

The place is a garden now with gracious, airy rooms, great bathtubs and floods of hot water to wash off the Malawi dust, and a fine dining room upstairs for a look across the lake over dinner. We four had our evening libation—South African red wine or scotch and thence off to dinner. At night the wind blew enough to kick up waves and their crash lulled us at night on fine beds, fans overhead (too cool to use) and off to sleep. I had a raft of laundry done so as to arrive home with mostly clean clothes.

July 29, 1989

Malawi, Livingstonia Beach Hotel

After breakfast I talked one and all into visiting a local aquarium—which turned out to be a place that raises and ships the colorful cichlids to various places for the aquarium trade. I've never been too excited by cichlids—and after a polite visit returned to the hotel for lunch and a good long afternoon nap.

Carrie somehow found out that there was a fishing village next door. Soon we had three guides: Lawrence, Charlie, and Thomson. They took us through the wire gate at the back of the hotel into another world. It was a fishing village but also had a kerosene-lamp-lit restaurant of one room and a dirt floor, a brickyard, a place to smoke fish, and many little thatched houses. A thousand people lived there.

First we looked at net—nylon, $\frac{3}{4}$ in. mesh or so, plaited sennet lines (very strong), plastic bottle floats. Then we passed trays and tables of little cichlids drying—some only an inch long, their bellies not even slit. Next came a brazier on which slightly larger fish were being toasted, also not gutted. Then we went to the smoker where trays of cut catfish parts in screen bottom trays stacked over a smoky fire cooked for a day.

Then out back was the brickyard, which they said the chief had chosen when he decided where to place the village. They had one brick form they dug, mixed in water, and put mud in a single brick form by hand, patting it down, and then turning it upside down to dry. A 1½"-long indentation put a dent in the brick which I suppose helped to key them together. The brick maker was incredulous when I told him I made adobe bricks. We compared recipes and decided sandy soil was best because it didn't crack upon drying.

Then the tiny little kids began to gather. I had three by the hands squealing and trotting along at one time.

We left through our fence and paid our guides a few Kuatcha—they wanted 20, and went off to bed. Our guides kept asking for clothes and shoes. They were ragged, but as they said, they had enough to eat. I want to send them some of my excess clothes.

Tomorrow we drive to Lilongue and board a plane and head for home.

July 30, 1989

In the air enroute to Nairobi

We had a nice drive up to the plateau with only minor adventures. We had lunch adjacent to a strychnose tree—in SE Asia it supplies strychnine—here it may not be poisonous.

Then we had a hassle turning in our car—the agent never showed and we left papers and data with the American Express agent—only the speedometer didn't work so it's anybody's guess. Then through customs, a body search, on Air Malawi to Nairobi. We now wait for Pan Am to get its act together. It's 12 midnight.

July 31, 1989

West Germany, Frankfurt

Well, what was it like? First, the company was the best. We each saw different things and traveled easily with safety and mutual enjoyment. We emerged wanting to go on (why leave the Livingstonia Hotel now?) We experienced an amazing lot—the animals, the continent, the scenery, the people, some of their problems and prospects. We didn't see the worst of Africa, but instead places on the way up, scratching and clawing their way up toward a future age when blacks have their own skilled classes.

We saw and sensed the remarkable friendliness and openness of the people, especially away from the cities. It always seemed possible to light up the kids with a smile. The reticence may stem from our tendency to travel poker faced and their deference to us as exotic, unknown curiosities. We were surely creatures from another world and another life in many ways. It's hard for us to realize how unimaginably wealthy we are compared to Benson who earned 1.80 kuatcha a day (a kuatcha was 2.74 dollars).

The wild animals are confined to parks for the most part and pursued and threatened elsewhere. We saw very little life, even birds, between park boundaries.

Health is an enormous problem. There is no way most people can avoid malaria and other parasites, considering how they live (no screening, no way to avoid parasite vectors).

The difference between rich and poor, even in their own cultures, is great, and probably growing greater. The struggle with education is being waged. Many obstacles intervene—culture, money, tools, a history of [?], etc. But I think, at least where we traveled, it is cherished and even a lightly trained person by our standards can mean a lot, and can become important.

The most progress has been made when there has been peace and relative stability and especially a willingness to use professional whites as part of culture. That was the case in Malawi, but rather rare elsewhere.

The spectre of AIDS hung, for me, everywhere. I wondered about its impact. Uganda, that we edged upon, reportedly has an infection rate of 40%. How will that play out? It may also have been very high in Kenya, Malawi, and Tanzania.

Population growth is an enormous countervailing problem in these countries and drags heavily, I hardly doubt, on everything they attempt.

For us, our trip was an idyll. We traveled as four warm comrades, had wonderful experiences by the dozens, and shared a sense of the preciousness of our trip in the group sense. We shared a lot. We are indeed, the fearless four.

The continent is largely undeveloped where we went. The people raise their own food mostly without benefit of irrigation or powered pumps; they wash in the green rivers, they do not have toilets or bathtubs, they cook on local wood (now in increasingly

short supply in many places), and their villages are apt to be clusters of thatched rondavaals. Only now and then does one find towns or cities.

Men mostly walk with other men, and women cluster, carrying food or clothing on their heads. Couples are rare.

One senses balance in their lives—time for songs and time for play. The kids seem loved and they carry even littler kids. Moms sling their little ones on behind in big swatches of cloth, often with the beloved leader Banda's picture on it, and always a splash of color and somehow clean.

One sees rather few old people—those with gray hair for example, but swarms and gaggles of teens and twenties. Life expectancy in Malawi is a bit over 40.

My impression is that “undeveloped” is a curious word. The land is developed and it holds about what it can in terms of people and their present methods, unless the artificialities of hi-tech civilization allow a denser society. The limits now are disease, mostly, but certainly locally, food, and sometimes warfare. I suspect there is now a cap growing on a population that will be increasingly effective if development doesn't intervene.

Africa is beautiful. It is also mostly old, old terrain. Only the Rift Valley with its scarps and its associated volcanos and deep lakes is young and abrupt. I was swept away by the miles and miles without any improved road at all, just away from the tourist track, but with people on foot driving flocks or herds of cattle just about everywhere.

In Ngorongoro we were shown Masai trails all along the rim where cattle were driven over to reach salt licks, and the majority came from places where there were no roads. Where it was only “untouched” skyline and forest and grassland, it would have had 40 hamlets, gas stations, motels, etc. in our country.

It made me realize how thoroughly enveloped the U.S. is and how the parks and reserves we have saved are now precious relics of a past time far more distant than in Africa—even though their game animals have been decimated. Much could recover in Africa where it could not in the U.S.

Well, that's what occurs to me at the moment. Now we dive back into American reality.

June 8, 1989

Grandview Campground, White Mountains, Inyo Co.

Thoughts at the End of Field Quarter, 1989

I've taken my chair upslope of camp among the now-silent pinyons. Cone shards carpet the shale beneath their gray-green branches. Warm morning sun glows off the smooth curves of the shaly slope, brick-red fragments of the Polita define the hill. I muse about this final uncovering of layers of sea bottom, which were sifted down before the first fish swam. The rock's moment of exposure is also its last. This sea bottom, so recently an intact moment in time, is already fragmented into tiny tiles only an inch or so across. Soon enough they will be dust and the Polita chapter will close.

Lizard-like I soak up the warm sun. It feels so good penetrating into my body, "healing," after a ravaged spring that I sometimes barely found my way through. Without my friends in the field quarter camps there might have been no spring.

I hear the wind come, off to the right over the ridge where the Sierra scarp comes into view. The sound is soft at first and then louder, air's breath on the trees. It sweeps over and around me, never changing pitch, only becoming louder and more directional. It sways branches overhead first—not down as deep as I am in the forest.

This wind must have come from some massive wave pattern in the unseen atmosphere that lies over the hogback ridge of the Whites. The lower side of this heaving blanket of air must have sent fingers and rivers of air down to play amongst the pinyon needles and, now and then, down against the shale where I sit. It is the voice of this powerful spot so much a touching of sky and mountain, a place for birds of the air such as swallows, swifts, and falcons to volplane in and swoop by before they rocket out over the thousands-of-feet-deep canyons of air in which they live and which define this ridge of rock on both sides. I'm as near to heaven as I'll ever get, I think, given my rationalist's view of things. Never mind, no moment could be more perfect. In fact, maybe that's what people meant when they talked of such things.

My boot rests against a windrow of cones banked behind a low bush, testimony to the fierce fire of life in these pines. The molecular will to live spews forth these cones, broadcast against the possibility that a tree will fall and there will be a vacancy in the subsoil battleground that determines which seed sets and which falls unable to penetrate, and is eaten. That's tree time. Only a century may matter much. Only the statistics of a million seeds may count. Certainly nothing I see in my day here matters at all to them.

All our passions, fears, hopes, loves, and touchings-of-spirits, are concentrated in the very now of a tree's life, or of a shale layer, or a mountain. Yet we live that moment with a singular intensity and a singular consciousness of what we might think of as our own "purpose." We live our moment as well in a city or a University as on a mountain like this, and yet there are differences that matter. That is why I think Field Quarter and ventures like it may have a valid role to play in affairs between we humans and our larger world.

Field Quarter is a curious hybrid venture, a mixture between a melding of 26 intelligent, caring, balanced people who are as diverse in outlook and experience as I could contrive from the list of those who applied. The diversity I sought assumes stresses, simply because it demands equally that members be tolerant of each other at the same time as it mixes them into an intimate brew. Only our obvious and happily universal care has carried us through. But most of us have felt those contrived stresses, too.

But, I for one, would have it no other way because a canalized view of the world from this or that special viewpoint is, perforce, so sterile an experience. We need to know that Yonat's intense social equation with the many people and people-problems she cares about so deeply may consume her seeing, so that contemplating a *Ceanothus* may not be all that interesting or exciting, and only after a time could she see why it was important.

We need to know that Libby's love for her city, its matrix of caring people, and their interwoven patterns of life is deep, and that only in our ignorant arrogance do we put our viewpoint over the place where she grew and still stands.

We need to know how Micah views history and nature and how he sees science as neither good nor bad, but instead outside the ethical pale.

We need to hear John's clear vision about knowledge and how it can point the way to a gentler interaction between humans and their world.

We need to hear the near-universal discomfort with science. How dare it dump its products upon our world unsorted, unjudged, and unassimilated?

We need to ponder the uncomfortable mixes of a worldview based on phenomenology and one based on faith.

Will it do to have a world in which we rely, as all of our ancestors did, on world explanations that we made up? Is it okay to explain your world even if you can't and then to live by the product?

Or is it more sensible to seek the boundaries of truth and to shape our affairs around the result?

Will knowledge of the world and how it works really provide us with the tools for living, or will such facing of reality present us with a world so harsh or difficult as to be unacceptable?

The diversity of social viewpoints we represent has also been set to the task of understanding the ecological rules of the wild world and of seeking to understand what they mean to us, how they might fit among our more obvious social constructs.

I've moved now, up higher on the fin of the hogback. The Polita shingles are larger and ring like bells as my boots hit against them. Gnarled and beautiful limbs too far away to be carried to a campfire are under every tree. The rock outcrops in sharp plates, and the mound cactus nestles against them—giant pincushions splotched with vermillion blooms. Lichens splatter the rocks with chrome-yellow, orange-red, and palest lemon.

My view opens across the Owens Valley, now takes in the Long Valley caldera and the entire Sierran crest to well south of the cirques of the Palisades.

Fields of dusty blue cloud shadow alternate on the Sierra with the blinding light reflected from snow-covered slopes cupped in jagged rock. It is still silent calm.

I've heard surprise that after all these years of leading Field Quarter students to these places, I could retain my spontaneity or care about each of you. Let me say simply that aside from my family, these annual ventures are the most important events in my life. You are my companions in that life, my source of understanding about how the world changes and how I must change, too. You are the rejuvenators of simple love, joy, and human care that make life an unfolding adventure of understanding instead of the repetitive playing over of a long-learned theme. Life for me would be very much less rich without you. I love you all in so many ways and I feel graced to be amongst you on this mountain. I hope you will be with me always for just a meal or when you might need me, or just want to check in.

I've moved again, picking my way to a rocky ridge overlooking Black Canyon. I can almost see Shulman Grove now. My chair spans a breadth of pinyon felled by lightning, I believe. It is an utterly lovely thing, lying outstretched and twisted on the shingle now, rich buff and pale lemon yellow wood, with whorls of black, which I presume are plant fibres that stain its wood. The roots are burned but I can see where the sap has sunk to permeate the wood until it cuts like wax and will catch a spark and light—the flame wood of the Indians.

What might we have learned? I hope people perceived the life on mountains and deserts as intricate and interwoven—the 10,000 stories on a mountainside. I hope you

perceived this life as running with the greatest economy with wastes, or life itself fed back into the cycles of life to take part again and again. I hope you can perceive that this world in balance is the only one that can last and that our human constructs have swung very far away from such a norm. To me there is no question that compensation will come. It's only a question of how ordered or disordered it might be and if we can hope to influence this process.

I'm also sure that our own lives are best lived if each of us finds a way to be on the positive side of the equation, and if we cluster together in nuclei of care and of love and support for one another.

I love you all, every one.

Ken Norris

Field Notes 1991

Grand Bahamas—White Sand Bank	July 2-8
Tahiti-Moorea-New Zealand-Australia	September 4-October 5
Desert Futures	
Roger Samuelsen	
Global Field Theory of Sand Dunes	
Protecting the Desert	
John Burroughs Medal	
Sweden—Kolmardens Djurpark	May 29
Galveston, Texas—Bernd Wursig	June 2
Japan Trip	Feb 13-19
Trip for <i>National Geographic</i> Hawaii with Jan and Ania	May 8
Woods Hole, Massachusetts	May 26, 1991

July 2, 1991

Bahamas, Grand Bahama, Freeport, Lucaya Beach Hotel and Casino

Yesterday was spent in the long trip from San Francisco/Santa Cruz to Grand Bahama Island. But here I am, the next day, in the Lucaya Beach Hotel and Casino. The tables are still, down the hall; it is too early, but the fauna is gathered in the almost stifling heat of the beach at my back. Flip has not yet arrived.

No major hitches yet. I climbed the mountains above San Francisco Bay in a lovely clear dawn turning orange as I descended the hill to long-term parking and thence to the gate . . . looked at Nevada, the northern Great Basin, and thence into broken clouds over the plains and into the hill country; Nashville, and thence to Miami and a switch to a puddle jumper to Grand Bahama and the Xanadu Beach Hotel—grand but decaying. Nothing much worked but the people were pleasant, slow, and if you slowed a little, doing their job according to the local rubric. Nonetheless, [?] don't work, the toilet bubbles and steams, why I do not know. Flip called it "the pits" and moved to a more live[?] casino-hotel down the beach.

The place is flat coral, casuarina, a clean under[?] shore ("Where is the snorkeling?" I hear one disgruntled woman cry.)

Now I make sure I have everything—towel, dark glasses (a must in this bright light).

I don't know when Flip will arrive, but I'm stashed in some expensive room and nearly ready to go. I'm apprehensive about how I will handle the heat and the light, but we'll see.

Flip showed about 6:00 PM. We went to dinner and got caught up. Off to bed watching Wimbledon on the TV.

July 3, 1991

West End, Grand Bahama Island

Flip and I had breakfast, paid our bill, and were met about 7:00 AM and driven down the island to West End Village—very dilapidated and seedy. An old hotel rotting in the casuarina jungle, and then we came to a nook of a harbor replete with big yachts, tour boats, nipping flies, and 98% humidity, and then, half an hour after we sat on the dock, in came the *Wren of Aln*, our catamaran home for the next five days. She's sliding in now, looking trim and tended. Denise Herzny standing on the bow. She's bright red to the water line (the boat, not Denise). Here's the crew of the *Wren*:

Lynn Thomas—Cook

Lynda Green—Activist, interesting

Dan Sammis—Skipper

Denise Herzny—Research Director

Bill Carr—First Mate

Dave Schrenk—Technical Assistant

Chris Travbhber—Director, L.A. Harbor Presidential Board

National Geographic Photographer—Flip Nicklin

Janice Hawkridge

Joetta Roddick-Shea

After a perfunctory customs check, we headed out onto calm seas, in the blue deep water, up along the inner margin of the bank that defines Grand Bahamas Island. Soon the low fringe of trees that brushed the horizon at first disappeared and we were wholly at sea. The sun beat down quite unmercifully for a poor, pale, coastal Californian. I shed down to a shirt and shorts and doused myself with sun cream, which seems to have cooked.

We cruised along, now over the bank, now in blue water, till we reached the sunken hull of a wrecked steel sailing ship, perhaps 250 ft. long, called the *Sugar Wreck*, down 18 ft. (1908). We anchored and everyone tried all their gear by stepping overboard and swimming around. The bottom was dotted with waving clusters of soft coral, patches of sea grass, *Fungia* corals, and quite a fauna of lovely fish down in the bits and pieces of the wreck. I saw Pomacentrids, a hawkfish, some little striped schooling forms and others. I was mostly busy trying out my new diving gear—a suffocating sexy electric blue and black dive skin that bid fair to give me some real sun protection, a skull cap courtesy of Lynn (essential for my exposed and vacant head skin), a pair of electric lime green flippers, and an old mask that works pretty well. The water is like gin. All around the horizon stand afternoon cumulus and even a hammer-head cloud or two. The swells are low, maybe a foot, and the air very warm.

I've begun to know our fellow passengers. We'll see how it comes out at the end. There is a pair of women who met in a sauna—both have been around a lot to various countries—Joetta and Janice, the former much to the Near East and the latter Europe, I believe. Both hold views about the future shape of the world. Linda, outspoken activist, mystic, seeking and finding connections of intelligence, love, peace, family, contact between persons and animals. The responsive chord that dispels the long loneliness.

The crew is attentive. We have an elegant meal just as the sun sinks, blood red beneath a cloud deck.

We talk of the blind fish of Iran, of Japan, and Japanese and much more.

A video in the cabin (Audubon, about dolphins). Off to a sleep on the gently heaving deck in the variable breeze that crosses and recrosses the deck.

Scorpio hangs like a great jeweled hook, from the jib top, the mast light swings in a crazy little circle. Winds come in gusts from dead ahead and the pencil flashes of fish darting scribe the swells. It is damned hot and dripping with humidity. As the air cools the sticky air glues me to my plastic pad.

Conversation with Linda Green—

Connections make a difference to them. Intelligence. Do we understand it? Maybe not. They're peaceful, take care of each other. Family structures seem strong. Loyalty to each other. Do they love us? Why? I think so! In view of the terrible things we've done to them. Telepathic connection.

Are all these things we miss in our relations with ourselves? How much is made up? How much do we really know? Does it matter in the face of the problems we face? Is this an emotional cry about the way we deal with our world? Powerlessness and faith.

Bahamas, Over White Sand Ridge

The heavy wind buffets as I try to cover myself with a thin, knitted coverlet—too hot! I move aft to get out of the blast a little and find a place on the fantail with just a little breeze and by sleeping on top of the coverlet, the sticky plastic is avoided.

A shot from Cape Canaveral arcs up and across 2/3 of the northern sky. We see the orange ball of the launch, watch it arc up, watch separation No. 1, then see that fall in a glowing arc, see the second fall, and then the clear bright line of the rocket bend over and finally disappear outside the atmosphere.

July 4, 1991

I finally drifted off astern on a too-short pad, but generally comfortable. Finally, I watched the glorious dawn come, billowed clouds stacked high over us in decks, the upper billows turned elegant pale-pink-orange against the gray-white clouds in the foreground. Down below the floor of the cloud castle a fringe of gray pokes down. The primordeum of a water spout. It swirls into a long finger, but never reaches halfway to the sea.

Dolphins are sighted, a couple of bottlenose and then later 2-3 spotted dolphins laze by. Flip, Lynda, and Denise are rapidly in the water swimming, hopefully outward. The dolphins flirt and are gone. Denise knows many of them now and knows generally where they go and what they do. We talk of how they fish. They will dive down and come up with flounders.

Dan the skipper says he's watched the *Bothus* events and thinks it's different when he chases one and when the dolphins do. He says when he scared a bothid up it fled purposefully away. When the dolphin caught one, it often fluttered around the dolphin, this way and that, to be snapped up. I saw the latter clearly in one video.

Another video showed the black eyes of the fish above the sand and the fish's outline was evident.

There is much echolocation going on during these feeding sequences and much scanning.

We saw one sequence with a bonito following a dolphin in the kleptoparasitic position.

We cruised along the margin between indigo blue and turquoise and past two other boats waiting for dolphins and at last to anchor on the fine coral sand in 20 ft. of water.

We set a watch for dolphins and three times saw them, only once close enough for divers to insinuate themselves.

I dove on two and not on the last when three young spotted dolphins came in as we cruised over a sand bottom 20 ft. down. Half a dozen divers entered the gin-clear 81-degree water over immaculate sand and were soon with the three who stayed with them, tumbling and diving in the water often close enough to touch, though we had been instructed to refrain from reaching out. No one did. The dolphins dove and gyrated around the humans. Half an hour later the divers return. I hear cries of pleasure, wordless often enough.

Lynda's quotes: "I tried to sing to one." "I heard them whistling. They'll both be on tape." "I swam around them and they me with just inches between us. I don't want to anthropomorphise, but I felt so connected."

The dolphins seemed never to speed up but to accommodate to the slow humans and then after half an hour they quietly speeded a little and left.

There was no denying that they "dropped by" with the awkward human swimmers or that there was a kind of comradeship there. They lollygagged with the swimmers, circling and twisting, arcing off for shallow dives. Or that there was trust. There was no pulling away, not a hint of aggression or fear. They knew what to expect of humans and it did not send their pulses racing. A gentle welcome, a connectedness flowed back and forth and then they moved on, not with a burst of speed, but just "moving on." Perhaps the dolphin telegraph told of events ahead and they said, "Well, I gotta go now. Thanks for the little swim."

Then another group was sighted—five or six fins against the luminous turquoise of the shallow bank. I went below and pulled my dive skin on, grabbed my fins and mask, and tumbled off the rear step into the warm sea. I cut across the catamaran's retreating stern toward my comrades already in the water. Below me, lazily over the immaculate rippled sand, glided a yearling spotted dolphin, going about as fast as I could glide with fins alone. We cruised along silently, me above, he below, tail outstretched and gliding. He rose slowly, turned at face level, curved half a dozen feet in front of me. I could see that the immaculate baby's breast was giving way to a juvenile's speckled belly. He curved away as I stopped to watch, soon becoming a gray form among other gray forms of his brethren against the dark blue of the distance.

I was awkward in the water from a long time away from fins and face plate, but I persisted through water seeping in over my moustache and worry over getting cramps from using fins for the first time in a long time.

My but it's hot out here. The sun blazes down, the sea glitters and reflects. It's in the 90s with 98-99% humidity. One doesn't move fast, except in the water (81-84 degrees F). In fact, it's not far from physiological limits, seems to me. The sky steams with cloud billows; only the sea ameliorates, and it's there that the dolphins cruise.

I must say these new "Dive Skins" are marvelous—a full body suit that stretches to fit and protects just about everything from sun and modestly cold water.

We had a great 4th of July party at dusk even though I failed to get people to give political speeches. We had bunting, a fine steak dinner (on the barbecue), drinks (margaritas), and then fireworks made by Captain Dan. He'd made these from kit rockets and firecrackers. They whooshed and banged, a couple even arcing over perilously close to the mast.

Then we talked. We have three women aboard as visitors (Jan, Lynda, and Joetta), who were great fun to quiz about why they wanted "to experience dolphins." All had had personal experiences, near-death transports, clairvoyance, etc. that made them impatient with the stiff "rationality" of most scientists. There was, I thought, a need to believe, a great openness to connections with the animals, a need for unspoken trust and what better wild animal than the dolphin, who actually came to us, in evident acceptance and interest.

There is, it seems to me, deep femininity in all this, deep concern for the state of the world, much concern for what humans have wrought, and not a little feminism that says: "We women must find a way to make our values work in the world, as opposed to exploitation and destruction." This connection comes to mean much, the cooperative way, the nurturing way.

July 5, 1991

Bahamas, White Sand Ridge

I don't think I know all the dimensions of this, though I try to extend myself. We saw a few dolphins today, all spotted as far as I know, and they lazed on past us without giving us much chance to join them. Apparently, this is increasingly common. I don't wonder. For these tactile animals there's little in it for them, seems to me, and contact is frowned upon, at least on this boat.

I'm getting a little more used to the heat. It doesn't seem so oppressive though I don't think it's cooled down any in actuality.

"Over the whirs of the margarita blender, the call rose: 'Dolphins!' from Captain Dan." (Quote from Flip). I raced below into the sleeping compartment to change into my suffocating, sexy dive skins, stripped down, and caught both feet in the fabric. A silent tussle ensued as I bent over, oblivious of what might approach from behind, and freed each leg in turn. I hurried up the gangway, stripes slightly misaligning, grabbed my mask and leaped in, swimming after the others already in the water. The two juvenile dolphins, Barb and Mask, swirled in front of me. Barb pooped out a long, lumpy, olive stream. I clasped my hands over my mask straps so the larger particles would go past unimpeded. Is this a statement of the relation between the species, I mused . . . (This I read to the assembled divers after we returned.)

I paddled toward the dolphins who swirled in arabesque with the divers. Chris, the doc on board and the president of the board for Denise and a powerful swimmer swirled down with the two animals towards the bluish white sand carpet, 25 ft. below.

He was photographing as he and the dolphin twisted in a tight spiral toward the bottom.

The two came over to me as I paddled toward them. One arced over and around me, turning its speckled belly toward me in what I knew was a signal of affirmation. The other arced and rolled behind and around me. I rolled and dove down toward the bottom as Barb swirled past again turned her belly in affirmation. I reached out a hand and trailed my fingers gently on her dark flank and onto her tail. She stopped her tail beat and my fingers trailed across the top of her gliding flukes. She turned again toward me and arced effortlessly away, my fumbling swimming a gross charade of her effortless locomotion. Beyond the pair I could see my companions in the water: Chris, Janice, Joetta, Flip, and I could see the gray shapes glide toward them, waiting in the water. They gamboled this way for half an hour, moving among the enthralled swimmers.

Not a hint of distrust or fear or aggressive intent passed between us. A remarkable encounter with wild beings.

Dan says it began when treasure salvors worked on the *Maravilla* wreck near here and dolphins came in around the divers, curious, attentive.

When Dan first came in 1985, they merely anchored the vessel and the dolphins of all age classes would begin to cluster around the boat waiting for divers to enter the water. They would play for as long as two hours. Now with more boats in the area, it is heavily the juveniles, such as Barb and Mask, who play for long.

I had clicked to them and could see their brown eyes goggle at me, but not turn away or toward me resulted. I suppose they've heard it all.

Dan said the pressure on the dolphins was rising. More boats that wanted to remain unregulated came to visit and the dolphin's interest is waning.

Dan is afraid for the future and his attempts at getting the Bahamian government to permit visitors failed as other boats resisted the attempt at control.

My impression was that to adults we clumsy humans were no longer the stuff of curiosity, except to the curious young. I know I've felt that way too. My fires for contact are not nearly so strong as those of those of us who made their contact with dolphins for the first time.

Joetta talked to me about her experience, mostly in Saudi Arabia and Iran, out with the camel people. Interesting and easy to talk to, I thought. She seems able to go anywhere and deal with anything. Very centered, seems to me.

Her meeting with the dolphins was a strong experience. They stitched her with echolocation clicks, which she said she felt strongest on her sternum. She had circled down and around with them, halfway to the bottom, for the better part of half an hour.

July 6-7, 1991

A good dinner, talk, videos of the day's events, and out onto the fantail on a pad with my light blanket over it to keep from sticking to the plastic. The lightning flashed and then the thunder boomed closer and closer. Finally, I moved under shelter, but the rain bypassed us. Finally, tired of teetering on the inadequate bench, I moved back on the fantail pad. The blanket was damp now, almost sticky and finally I got up, rummaging around for a towel, found an inadequate one, and went back to sleep. Now breakfast is past, the day grows hot and muggy, and I got out on watch for a couple of hours. It's typified by light puffs of wind and low chop and a cloudless sky with the hot sun searing down, and the turquoise sea all around us, a band of ultramarine at the horizon where the deep water is, and cumulus castles growing in the distance.

It grows hotter and Lynn, Dan, and I slip into the water over the wreck of an old metal tower. Gray grunts were there in dense schools, clustering over the angular metal, so close they must have touched fins. Out in more open water were special schools of yellow-lined grunts. I saw one follow a barracuda from a distance of three ft. A cluster of half a dozen three-ft. barracuda lay quietly in open water, 20 ft. from the metal while nearer in, two or three trigger fish sculled along.

I doused myself for a while and climbed clumsily over the stern and washed off.

Not long after lunch, a group of five dolphins cruised lazily up to our inflatable and our team poured into the water, Denise leading with her big underwater video pod with which she has been getting absolutely crystal clear tapes from right among the animals. You can count every sp. if you want to.

[Map of area]

We're headed back down along the bank toward the west end now, seeing if we can find dolphins along the edges. Denise says bottlenose may be found throughout the shallows, but spotted are more toward the bank margins.

Back into the water again. My mask leaks over my moustache as I expected it to and is a damned nuisance. I haven't taken time to get my act together as regards skindiving. It's been a long time and the motivation is low. I'm afraid of sunburn, especially on my scalp where I have already had keratosis removed. But, in spite of this, it's been a pleasure to skim over the rippled coral sand 25 ft. below and look for fish, conches, and the like.

I've had a couple of good conversations, one with Lynda and one with Denise, about the lure of swimming with the dolphins. Here's what I perceive:

There is a widespread feeling of powerlessness in the face of contemporary problems by many people, especially women, who are still oppressed in many subtle and not-so-subtle ways. There is fear that we are destroying our earth, and men are heavily implicated. There is fear and revulsion against the growing violence in human society.

There is fear about where science and technology are leading us and the strong perception (and actuality) that this is significantly male-dominated activity. The tendency toward analysis of everything feels like a root cause, leading to unleashing untold forces upon humankind that we are seldom ready for.

Consequences are the increasingly obvious degradation of the environment and the human and natural condition of the earth. What remains unspoken is the reproductive force that [?] that problem. The dolphin is known to be "intelligent"—what shapes this take is mysterious. It lives in the 70% of the earth that we don't inhabit. It has a remarkable, innocent acceptance of us.

With all our guilt about the state of the world, here is an animal that will, if we let it, allow us to just be in a momentary, almost cosmic meeting of two species. Can they, somehow, be teachers? They appear to know about the good in us and accept us into their midst for this good.

From their standpoint it is a totally non-judgmental meeting, and from ours it is pervaded by their "good." They seem to perceive this connection in ways we do not easily understand when we try to analyze it, but when we are "just being," there it is. They appear subtly and almost unknowably sensitive in their acceptance of us.

I once thought sexual overtone was deeply involved—the powerful racehorse of the ocean, sleek, powerful—Poseidon—but I no longer think this is central, though it may be there at times.

Denise's project goes on for six months to a year. She charts this vessel for \$120-140,000 a year. She has elegant video capability and data logging and handling capability. Her foci have been identification, following life histories, some emphasis, but modest, on daily movement and habitat use. She is narrowing down to more and more important questions. She sees interesting vistas ahead and is reaching toward them. My impression is that her program would benefit from further structural consideration and attempt to:

- 1) Define where the animals go.

- 2) Sharper questions.
- 3) Pinpoint what they do at night and by season.

This afternoon as the sun slanted across the water, leaving the depths darkening toward lapis, we came across a group of perhaps 12 spotted dolphins, including old friend Romeo, an old fuzzy spotted male. The sea was flat, with wandering corridors of glassy water amidst large tracts of inch-high ripples.

The dolphins approached the *Wren*, lazing along in a loose group spread over 200 m of water. Some were down and others up. Their formation was so loose. There were old fuzzed males with white beaks, speckled juveniles, and small two-tone young, as clean as little tunas.

We are divided into two diving watches so that we will be easy to keep track of, and my time was up. I went below and through my gyrations to get into the lycra dive skin, which for all the trouble has kept me completely free of sunburn on most of my body and comfortable in the water, too.

Into the water I tumbled, a hand on my mask to keep it from being ripped away by the rush of water. I ducked, blew the water free from my snorkel, and looked around the underwater perimeter to see my shipboard friends swimming ahead 50 m. away amidst a cluster of dolphins. I stroked closer and soon was with three of the animals myself. They dove effortlessly toward the immaculate rippled sand 20 ft. below. The lead dolphin twitched its snout almost imperceptibly from side to side, snout angled toward the sand, two ft. below. It and its companions twisted their heads down, searching and then rammed their snouts in the powdery sand, up to their melons. One snapped and emerged with a fish in its mouth.

Later, a two-tone juvenile did the same, obviously echolocating the bottom, detected something out of sight below the sand, and dug its snout in and came up with a 8-in. sea cucumber, which it carried up a ways, shook and dropped, drifting end over end. I did not doubt that the dolphin had detected a shape through an inch or two of sand, or that it would rather it hadn't been a cucumber.

One lizard fish was caught in this way and the dolphin carried its prey right in front of Flip.

Dan Sammis, the captain, is a gazelle in the water and I swam above him, looking down as he swam in tight twisting loops with two juveniles.

The dolphins twisted and turned right with him, and shot ahead with occasional fluke strokes that told what they do alone.

I tried it—with an old mottled mom and her daughter. They stayed right with me, they on the outside and me in the center. The game was synchrony, the arabesque, and I was not good at it while they were consummate dancers, but not, remarkably, impatient ones. They obviously slowed to our pace much of the time, and when they wished to, rocketed away at a pace no one could follow, off into the blue veil where some imperative called.

The old mom, Hedley, and her baby, Havana, a sleek two-toned child who carried a remora, came by so close I could look the remora in the eye as it hung on Havana's belly, up between her pectorals. Its light-gray, pudgy body swashed limply in the current as it held on tight by its head sucker disc.

Down deep below I could see Flip, weighted and able to cruise right with the dolphins down among the channels and ridges of the coral sand. He moves as easily as a big sleek fish, dark-skinned now and powerful. I watched as he spun around amid a spiral of dolphins, his camera face glinting up toward me, finding and choosing what to see later.

PRI, a ferzed[?] adult female, came by with her speckled teenaged (four-year-old) daughter Poindexter. She let me swim close with them. I pulled up alongside—inches away—the old female, so close I could see every spot and tooth rake, and watch her shift her brown eye back to watch me. Poindexter slid up between us. I was in a dolphin school, so close I could see only part of each dolphin. A pectoral reached out toward me as we circled together, the sleek body of the juvenile slid up between us until her and her momma's dark flukes cut up past my tentative hand, held in close so as not to push them, and arced away, out of touching distance and away toward the others who gambled with other swimmers.

Obviously we were in a game. They were willing to play with us, though they continued to feed as we watched and later . . .

After my *tete a tete*, I paddled after the others, now off in the blue haze at the edge of visibility. I could see the dolphins arcing and circling among the swimmers, graceful, swift as arrows, compared even to Dan and Flip, and at a distance I could see that it was the dolphins who waited, patient with the humans. But when Dan, a fish in the water at 20 ft. down, began to swoop up and over in outside loops in 10-ft. vertical swoops, I could see the excitement run through the attendant dolphins. "Here was one of these aliens," who swam well enough to be fun. The juveniles bolted into a pantomime of his arcs, up and twisting and over, with no obvious thought of a breath. Dan broke away and glided, head up toward the distant mirror of the surface. The dolphins turned away. But impatience with us is not a mark of these dolphins. Quite the contrary. They were remarkably patient and gracious with us, not show-offs of what they could do so infinitely better than we.

That patience and acceptance of theirs was striking to me.

Yet their life patterns continued. In the afternoon a group of adults had a jaw-snapping spat with each other, intense enough that our divers moved out of the way, afraid of becoming objects of attack. The dolphins also continued to feed when the opportunity arose and mothers sent subtle signals to their children to stay at her side or face the discipline of a slap of her broad dark flukes.

Even after we left the water as dusk began to fall over the sea, they stayed with us. A pink-bellied baby bounded across our bows in a series of joyful leaps, short-faced and innocent of [?] as any baby.

As night fell, the boat drifted out 575-800 ft. of water. Dan put a light over the stern and the life began to gather. At first the game was to catch the darting schools of squid that flashed in and out of the light circle, but then I began to notice a wonderful array of smaller life and we dipped it up in buckets, the net mesh being too large.

Little grass-thin, brownish pipefish drifted by, hooked like a sea-grass blade. Only their tiny eyes and snouts gave them away as we dipped them up.

One magical little larval fish drifted by and was scooped up in a bucket. Looked at sideways through a mayonnaise jar by flashlight, it was a beautiful mote of life. A

pudgy, rose-red body, shining silver, visceral cavity, rose silver gill covers and almost invisible crystalline fins, shimmering with passing parades of sine waves holding it, fluttering, in place against the glass barrier. We slipped it back in the sea.

A flying [?] came up, whitish wings outstretched. A yellow-bronze file fish drifted by, mimicking sea grass, and then a larger one. Then up came the most lovely animal of the night; a flattened squid, a bit like a cuttlefish, but without the pneumatic shield. It had apple-green-jade eye capsules and patches of color pulsed across its body—garnet red, golds, blacks, dustings of charcoal. It had rather pudgy arms and a dorso-ventrally flattened body. It held its arms together in pairs, bent upward when it went forward and streamings behind, I recall, when jetting backward. I would guess it at 5 in. long. It had been drifting when we caught it mimicking flotsam. We let it go.

A chain of salps revealed itself by the dots of dark in crystalline bodies, so transparent that only their faint scintillation revealed their presence and then the ciliary waves that propelled little red worms into their “mouths.”

We quit and headed for the deck above. I had a bit of fear about stray electricity from the light’s junction box sitting on the wet deck just above when we dip-netted.

July 8, 1991

Now we cruise along on the flat disc of the rippling blue sea. The water is clear turquoise here, lighted from below by bright sunlight reflecting from the brilliant white coral flats below. A band of dark blue off toward the horizon shows where the deep water is. I am urged to go swimming with a school of about a dozen *Tursiops*. They are battered in various ways—a fin tip tattered, a fin missing, a forehead white from some old altercation.

Flip, Bill, Denise, Janice, Joetta, and Dave are in before me and off in the direction of the school. I with my dive skin take longer to assemble. I feel better every day in the water—my arms loosen, my kick strengthens. I come to terms with my moustache and mask. Feels good, I must say. Another week or so and I might approach a fish as well as I ever did.

This boat works well. Dan is laid back, Lynne the cook is the soul of friendliness and cooperation. Denise focuses the program and looks at dolphin videos far into the night. Big Bill, the first mate, is strong, competent, and quiet. Not many rules here. Cameras and dark glasses, hats, radios, sun-tan lotion are piled in a jumble, on the instrument shelf of the bridge. But things . . . [?] . . . and Dave can fix anything.

I asked Denise to give me her study aims as a way of helping, if I can, as an Advisory Board Member.

- 1) Following individuals through life history as a way of understanding communication. Building a life table.
- 2) How do roles change over time?
- 3) Tactile, sound, posture, chemical, vision.
- 4) Need to develop rapport. Have them know us. Investment in relationship is Denise’s. Letting them let you in. Need a comfort zone.

She is working on a Ph.D. out of ? University in Ohio. (Joe Meeker teaches there.)

In the afternoon we crossed down the reef edge to a place where Dan anchored over a coral flat heavily populated with fire crab, violet and ochre sea fans, scattered brain coral, and little, winding, sand-floored reentrant valleys, 6-8 in. deep. The *Wren* was anchored in 12 ft. of water (she draws about 3 ft.).

We were taken by rubber boat 300 yards ahead of the vessel because of the current and let to drift back. It was a wonderful drift over the plant-animal-populated landscape. Many reef fish nearly familiar to me cruised the channels and flitted among the rocks; demoiselles, *Chromis*, iridescent blue with forked tails, green-turquoise parrot fish sculling jerkily with pectorals and tail dragging behind, wrasses, and the ubiquitous black trigger, identical for all appearances with the Hawaiian Humu humu ele ele.

A yard-long barracuda cruised along just ahead, expending little energy in his slow course. Pomacentrids were about—blue and yellow ones and a drabber brown one.

At the boat I hung on the safety line for a while, looking into the water and then went aboard, washed down, put my shorts on, and headed for shade from the still-potent sun.

About that time, a call went up: "Wreck, Wreck!" from some divers up over the reef a ways. So, reluctantly, back on went the lycra, fins, and mask, and back into the turquoise water to sea. The rubber boat dumped us in 10 ft. of water and there she lay—anchor chain stretched out, links 6-8 in. long in a long tangle to a metal stock anchor.

What we think was a metal mast step, encrusted with corals and sea fans, lay below me, perhaps 14-18 in. in inside diameter, and if this indicated the mast, she was in the 60-80 ft. range. Bent metal straps, 14 ft. long and ending in a big metal eye lay across the reef. I could see metal pins in some. My conclusion was that they were metal binders for the hull—the proper word is unknown to me, that defined the half arc of the hull.

Lynda and I most ungracefully got back in the rubber boat and headed for the *Wren*. Captain Spastic and Little Eva, we concluded. Another shower, strawberry daquiris on the afterdeck.

I must gather all my gear together and figure out when my flight is and head for Washington D.C.

We had a grand last-night party as we cruised back over absolutely flat water—strawberry daquiris—an execrable invention but effective, dinner, wine, much singing and guitar playing, and then creeping off to bed at some awful hour (about 2-3 AM).

July 9, 1991

Up blearily, packing, going by taxi to the airport, customs, a little American Eagle plane and off to Miami, thence Washington D.C.

September 4, 1991

Tahiti, French Polynesia

Fred drove Phyl and I over to San Jose and we began our long trip by loading our luggage onto a flight to Los Angeles and then to a Qantas flight to Tahiti. I had a business-class ticket courtesy of *National Geographic* and Phyl an economy ticket courtesy of us. I mentioned this separation to a gal at the ticket desk, and she gave me the sourest expression—a salute to my extreme sexism, or so it seemed. I, the oblivious male with the obedient female tagging along behind. It wasn't much that way though; Phyl wouldn't spend the extra cash and my knee hurt enough to welcome the big seat in business class. They put me up in the bubble, though it was black, and we couldn't see anything all the way to our 2:30 landing at Papeete.

A cab took us to the Hyatt, which turned out to be the old Ta'ara at Matavai Bay, which Joe Long used to own.

To bed, grateful for the length to stretch out, having seen little of Papeete except the flash of balustrade and porch balconies amidst the tropical trees.

September 5, 1991

Tahiti, French Polynesia, Park Royal Hotel

My aching knee is doing a number, especially after the cramped positions of a flight of nine hours or so, so I was glad to stretch out, which helped some.

It's a lovely view from our hotel, out over the channel to Moorea, which means "yellow lizard." Moo is lizard and Rea is yellow. What an island!! Bali Hai. Jutting black pinnacles and sheer cliffs against verdant slopes and bright jade bay. A white penciling of surf in the fringing reef and then the deep oceanic blue sea.

From here it is all shades of gray, from the clouds and veils of rain to the disc of the sea—very flat.

We slept long, finally getting up to take a tour of the garden and then have dinner on the upper terrace overlooking the lights of Papeete, the lights of the Chilean training ship *Esmeralda* at the harbor, rigging let . . .

At 3:00 PM we caught a flight for Moorea—a 12-minute hop across the "Sea of the Moon," (I think), where we picked up a taxi and headed for the pump station. No Michael Poole there; no one else either. I plastered the place with notes of our whereabouts and headed for our hotel up toward the NW corner of the island. Moorea is building up a little, though it is still bucolic and slow. Mostly mopeds and chickens on the single road.

We checked in at our hotel, a big, upscale place, tastefully decorated with 14-15 thatched cabins out on a peninsula by the lagoon and manicured with crushed coral beaches, outriggers for rent, parasails, breakfast brought around by boat—we were in the low-rent district. A room complex. Nice, airy, well appointed. Good service.

Dinner and to bed.

September 6, 1991

Moorea

Michael found us (I hadn't given him decent info on our arrival), and so off we went in our rental Fiat around the island to see the places Michael works—his coves, the places he makes his counts. He showed us all the passes. They prefer the deep passes and once inside never violate Michael's rule, which is don't go shallower than 10 m, and Ken

Norris's rule: don't stay over dark bottom. So they are found over coral sand patches, just like Hawaii.

Michael counts about 100 animals in the Moorea population, and they move around the island in relation to the weather—staying on the calm side. At Haapite we found a big school, way out just behind the fringing reef, going back and forth just as spinners ought to do—very quietly. There were surfers there, too, a couple, who had paddled for 20 minutes to get to the nice wave break . . . far enough that the dolphins were very hard to make out with the naked eye. In some places, long, blue, deep-water channels ran behind the reef, and the dolphins used these, Michael said.

I asked what Michael's plans were—what was he going to write for a dissertation—*The Natural History of the Spinner Dolphin*, he replied . . . identifications, associations, movements, feeding. My impression is that a single person can only do a fraction of this, even with part-time assistance, especially if limited, as Michael is, to a truck and a rubber boat. He can start and he should and has, but much will remain unknown.

He is collecting solid information, I think, and will compile his thesis this next year.

We circled the island and Michael left us to go home, way around at the SW tip of the island.

We will meet tonight for dinner at the Tiki Village for dinner and to watch Mareva, his wife, dance. Mareva, by the way, is “with child,” due next March or so.

We had a bit of a nap, walked the beaches a little and then followed Michael to the Tiki Center, a sort of Moorean cultural center where we had a luau and a show including Mareva as part of a Tahitian dance review—much fast Tahitian dancing by perfect women and perfect men. Then some show dances—ones with torches, another scary one with a machete and “audience participation” designed largely to entertain prim ladies from Iowa.

Mareva is quite beautiful. Quiet, religious (part of the union with Michael, I know), and pregnant, but not so it shows.

Phylly drove us back and we collapsed very late. I take these late-night affairs less well these days, especially with a leg that objects.

September 7, 1991

Hyatt Regency Papeete (Matavai Bay)

Today Phyl and I made our way out to Michael and Mareva's house for lunch. Quite an experience. And then we headed for the Moorea Airport, flew to Papeete, and made our way back to the Hyatt.

We arose very early (5 AM) and went to the local early morning market with guide Douglas, thence back to the hotel where we took a rental car around the island, looking at appropriate points for dolphins.

September 8, 1991

French Polynesia, Tahiti

Up at 12 midnight to make our way down to the airport by bus at about 1 AM, and thence through customs to the plane and then through the night to Sydney where we landed in the morning, to be picked up by Don Norris and taken to Manly.

September 11, 1991

Australia, Sydney, Manly

This day we arose and took the ferry across the harbor and up to the Australian National Museum and then back to Manly late in the afternoon.

I took the time to check up on Bill Dawbin and found that he was still a Research Associate, but that he seldom came in. He and Janet have split, over alcoholism I am told. Poor Bill, he has struggled with this addiction for many years. I wanted him to visit us and to go out to the desert with me. I doubt that he can respond, but maybe the invitation, the friend out there, will mean something to him.

Phyl and I spent some time looking at the aboriginal exhibit. These people, so primitive looking, so ancient, were particularly vulnerable to “modern” society. Their dreaming, which is their way of conceiving their origins, is full of everything that our ancestors believed, the natural outcome of culture—the ability to see and conceive fore and aft in time. Since nothing is real except the present, all the rest is imagined, or based on the thread of traded information from generation to generation—the oral tradition, or what we have learned to write in books. No wonder that in the glass of the aboriginal’s time, it included much magic, and the things of their contemporary lives. These things are all they know.

We stopped off at a big department store and I bought a collapsible cane, a great boon that let me walk with little pain, back to the Ferry dock (10 blocks). My knee is feeling a little better, and perhaps before long I will be more mobile. But I am doing well, I think, and the trip will be successful.

We had a long, long dinner at a poorly staffed restaurant—apparently the labor laws protect wages to such an extent that help is too costly to use. So restaurants are very slow.

I’m reading Thomas Wolfe’s book on his writing of *Dr. Faustus*, a fascinating book about the writing profession.

He had erected a structure he wished to follow, the story he wanted to tell, and then its parts, scenes, avenues, and then worked his way through seeking integrity through finding those who knew and then literally working his way with them. He honed and researched and honed and moved on.

So tomorrow morning off on the train.

September 12, 1991

Enroute, Perth on Indian-Pacific Train

Well, this morning, crisp, 15 deg. C, a bit overcast, we packed up our things, left the nice apartment overlooking the sea, and took a cab for the ferry, which plies the bay to downtown Sydney. Phyl had brought a little wheeled luggage rack which helped a lot, but failed in the exercise under the weight of our four suitcases, its thin pipe frame folded and bent.

We had visited Don and Christine’s apartment the night before. A tiny apartment on a hill overlooking the Manly shore. Don can see the surf and decide whether or not to go out. Christine is due anytime now with their first child.

We had a good chat. Don is entertaining, a good conversationalist, and with many firm opinions and the artists’s eye. Christine, quiet around us, is also full of opinion when

she opens up, very much the Aussie, and I think a little uncomfortable among all the professors. If she only knew how simple we really are, but it's never that way, I fear. There is always oneself to overcome [??] class to leave behind with all the complications that brings. Christine, a brilliant French lit student, came right up to the brink of completion of her dissertation and stopped. Her way was not clear and she couldn't leave her past, her family, and her old friends, I suspect.

We piled in a large cab, all four of us and our luggage, and climbed up through glassy, shining avenues of downtown Sydney to the train station, where we boarded the very long Indian-Pacific train. We were in A-car, right next to Bob and Ginny—two bunks, a bathroom, shower, a sofa, three-folding arms and nice, but not too clear picture window and two fold-down beds, a little closet, a mirror, and appurtenances.

The trip took us over west of Sydney into the Blue Mountains, Triassic sediments dissected into canyons and battlements of banded stone, clothed with eucalypt forest. It's interesting to see that it has an understory of acacia, ferns, and other low vegetation, while typically in the US, eucalypt forests are bare except for fallen bark. The ecology is complete here. The Blues were something, over 1,000 m tall where we passed through. Not mountains really—the best an old, eroded continent, more ancient than nearly any other can produce . . . a flat plate of stone barely breaking the sea's surface, wrinkled stone and no more, clothed with sand and salt pans in its arid center and around the periphery a band of green sometimes jungle and sometimes turned to grassland.

The latter is the way it was all the way out to Bathhurst where we had dinner. New shorn sheep, white against the close-cropped green of the pastureland took over. An undulating land, divided into paddocks or runs for the livestock. Little towns and [?] farm centers of a few thousand people were the peoplescape.

We had a nice dinner of Aussie lamb, drank a Barossa Valley champagne in honor of Ken and Christine's 4th wedding anniversary, and retreated to our compartments, I grateful I would take my evening Naprosin pill to still the pains in my knee a little. Damn thing!! It makes me steal off away from the center of things and go silent, sometimes when the ache gets strong.

Sunset came over the increasingly flat land. The air is clear and crisp.

Phyl and I both were remarkably sleepy, looking at the clock which said 7:30. We finally pulled the bunks down, unfolded the little steel ladder, Phylly up and me down, for a change.

September 13, 1991

Australia, Broken Hill

With dawn we would see how flat the land had become and how sparse the trees were.

The sun came up just as it does over the sea, and we saw a land of low shrubs, pans, red soil, and red gums in the wandering washes. The latter are very beautiful, really.

We wandered into the dining car for an enormous breakfast. We sit three couples across and one Aussie couple. A menu, cereal of corn flakes, oatmeal, then heavier stuff, sausage, mashed potatoes, bacon, hash browns, then more, fruit juice, coffee, tea. The clientele is largely retirees. One couple was headed for Broken Hill to take a five-day outback tour, which they have done two or three times before; very open, very down to earth.

We've seen a good many kangaroos—the big, red ones, bounding across the landscape, told by smaller size and bounding gait from the ubiquitous sheep.

Cattle are here too, and the vegetation shows the effects to a degree. I find there is a grazing board to protect the land from overgrazing and so far I've seen no decimation like that of eastern Oregon.

Birds, so far, have not been especially conspicuous. A few magpies, an eagle, some gullahs.

We slid into Broken Hill, a lead-silver-zinc mining area now nearly played out. The town survives as a supply center—20,000 people—very much of the frontier, though generally tidy. The air is crisp and clear. We stay half an hour and slide on toward Adelaide and the Millarbos.

The countryside gradually becomes greener as one approaches Pt. Pirie, which is near the head of the Spencer Gulf adjacent to Adelaide. They smelt and ship lead, zinc, and silver from Broken Hill here.

As we approached the gulf, the rolling hills were checkerboarded with wheat fields, most of which seemed to house a flock of new-shorn sheep. I don't quite understand how you can graze and raise wheat. I'm sure I've missed something.

We've begun to see emus, big unkempt rattita birds, a bit smaller than the ostrich (1/3 down I'd guess), that run across the low hills. We passed the lower end of the Flinders Mts., battlements of banded rock formed into low mountains and [?] mulga and rucalypt [?] water courses at [?]. In this low land they are a point of real interest. At home, few would know their name.

Soon we will reach the upper Spencer Gulf, turn south to Adelaide, where a new crew comes on board for the segment to Kalgoorlie. Our stewards, the food, the company, have been splendid. Three times a day, sitting I am called out and heads for the dining car, a big menu of well-prepared food comes in courses, as we watch the scenery go by. The Aussies are mostly very in a friendly fashion that is open and easy to talk to, quick to "lay it on the Yanks" in a friendly fashion that is easy to ignore.

I tried an Emu beer at lunch and it was superb, from Perth, I think . . . like Pilsner. We're seeing pepper trees here, casuarinas, eucalypts, clothing some of the low hills, or in copses out in the green fields.

We stop at Adelaide at a new station a few miles from town—and so are restricted to its institutionalized precincts for our hour stay; quizzing locals about the man who hunts starlings with a hawk on the West Australia-South Australia border (they've heard of him), and about camels—wild up north and apparently raised at Alice Springs. Christine has a book about the woman who crossed Australia on a camel recently. I must find out about the foreign commerce in camels that's reported to have built up.

One of our informants on the platform while we waited for the train told me that they used to have a brothel on wheels on one of the cars of the train to Alice Springs—the Ghan. (Upon reexamination this turned out to be on a Canadian Railway. Just a casino on the Ghan.)

Gone now though, and on this one alcohol is strictly restricted to the club car and is little in evidence on this trip.

Lots of naps, reading about the aborigines, the plants, the birds. We're not yet half way!

The portion of land around Adelaide and north to the head of Spencer Gulf is lovely, tended and green; wheat, rolling hills, patches of eucalypts, neat houses, graveled and embanked roads, and more and more houses. Everything is well kept and looks prosperous. The Barossa Valley wine country is just to our east—it must be undulating country—[?] and watered.

Now out onto the Nullarbor. We will awake before the great straight stretch.

At 2:50 AM we'll pass the halfway point at just beyond Tarcoola, where the line goes off up the Simpson Desert to Alice Springs and we go on west, and then slide out toward the Nullarbor, where by about 1 PM at between Mirina and Loongara we start "the long straight"—the more than 400 km in an absolutely straight line across the flat limestone seafloor of the Nullarbor.

September 14, 1991

We woke up just before the Nullarbor, in the midst of very red stabilized dunes clothed in mulga, *Casuarina*, and low shrubs. A smattering of wildflowers clotted the sand, especially around the bases of bushes.

Gradually it flattened and the vegetation thinned, until now out west between Watson and Cook it is utterly flat, a disc of earth as far as you can see in any direction. Vision is limited by the curve of the earth. [?] Vegetation is mostly low, gray saltbush and every now and then a larger shrub—3-4 on the entire horizon.

Beard describes it as bluebush steppe (*Marreana sedifolia*); treeless in its center with low trees of *Acacia* and *Casuarina* towards the periphery.

Watson was just half a dozen wooden buildings, and a Lion's Club and Rotary Club from Port Augusta to the east.

The Nullarbor is about 350-400 km deep from the coast—over an extensive flat limestone bench.

The clouds are flat too, a thin sheet of broken cumulus with blue above, fading to pale greenish blue on the horizon all around.

There are, now and then, low pans, green with grass and other herbs with occasional shrubs, but mostly just bluebush and sky.

These solution depressions are called dongas or dongers according to Beard. Apparently, during the great rabbit plague, the bluebush was decimated.

At about 10 AM we slid into Cook, right in the middle of South Australian Nullarbor. "If you are crook come to Cook," declares a sign on a steel tank by the tracks. It is flat! Cook has probably four dozen houses and perhaps a hotel. The wind whipped in from the west, 18 knots, warm and pleasant. Peruvian pepper trees, umbrella trees, oleander (a lady said the Aussie name was "holeander." Two portable jails of stout wood called "brols" stood by, doors open with their peep holes and bars, for us to photograph.

I was told this was a place for section hands to stay and for watering trains.

Off we go now, toward the border of South Australia-West Australia. We'll see the hawk man or won't we. He's supposed to keep South Australia's starlings from going west to infest West Australia and these birds are supposed to be hopping the trains so we may see him, though the wind is picking up ferocity, blowing dust plumes 40 ft. in the air above the roads of downtown Cook.

Bob informs me that the Nullarbor limestones are Cenozoic, perhaps Miocene. Certainly they are full of fossils.

The train whistle blew and we all scurried back on board. Phylly pointed out a pair of ibises stalking along in the vegetation. I hauled out my trusty Australian bird book and found the straw-necked ibis [?]*—*sometimes called “the dry weather bird, farmer’s friend, or letter bird.” They are cricket, insect, frog, crustacean, and mollusk eaters and said to be rare or absent in the arid inland. Take that, bird book! This is the arid inland!

We wait for a freight to go by and then off to the border!

Now about 11:30, the trees or shrubs have all disappeared and it’s just bluebush (an *Atriplex*), air, cumulus, and sky. The horizon is as precisely drawn as by a ruler. A bush a foot high stands out 200 m away. We enter Denman. A radio tower, cement ties, we leave Denman. No houses on my side of the train. A smattering of wildflowers and long, supple bunchgrass bending and whipping in the wind. One bush four ft. high. Perhaps a eucalypt or *Acacia*.

A road sign made of a tire alongside the two-rut dirt track. A blackbird the size of a crow swoops half a mile away. Two falconiform birds swoop and whirl. Ten minutes later, another, like a sparrow hawk. We’re on what the Aussies call “the long straight” . . . the longest straight railway line in the world, more than 400 km absolutely flat and straight.

Here and there along the track edge enough water has gathered to produce a splash of yellow. Somehow this imperceptible moisture has unlocked the seeds and they are free to bloom. About 5 in. of rainfall falls annually. A white flower, like tiny popcorn, speckles the landscape, half beneath a giant cloud shadow and half in the sun. The soil, reddish tan, shows through in ruts and pans. It’s been a rainy year I’m told. These flowers wouldn’t be here, maybe not even the bluebush itself.

A mile later, two sparrows.

Two bushes, three ft. high on the horizon, yet so far apart they move in two different planes of motion. Relativity!

I had xeroxed the rules to Whist and had half designed a test of Einstein’s theory of relativity to relieve the boredom of the Nullarbor, but we set all these aside, at least temporarily, in favor of trying to see if the big stick nests that occupy every fourth or so electric pole alongside the tracks were occupied. Now and then we could see black babies sticking their heads up above the rim, or watching for wedge-tailed eagles that we see every few km, wheeling and dipping over the flat plain.

A single house of stone on a swell of the land, the first one we have seen except for the railroad hamlets, is great cause for wonder. Two windows and a portico, then we find it a mile out of the town of Forrest. Forrest is not much more. A radio tower dominates three houses and a skultch[?] pile of old cars, abandoned rails, and crushed cars.

The plain is rocky now, with slabs of limestone and seemingly this shallow soil has relegated the flora to animals and grass, for the most part. The bluebush is restricted to patches like jigsaw puzzle pieces.

One can almost see the sheet of hardpan emerge as we roll along. A swell of land passes, and it is a mosaic of rocks, while downslope in the swales the thin soil prevails; but now sheets of tan rock, and scattered fragments are everywhere.

A big dust devil swirls and boils away over the slope of the land and is gone except for the swirling opacity it leaves in the air above.

The steady wind, almost planetary in its constancy, presses its fingers against the grass, sending broad ripples across its sward as it hurries on.

Lord, there's not much here.

There is much that is wonderful about this pace. The land dictates our enthusiasms and excitements by what it sparingly presents us. This pace lets us focus down on the real things that make this land, the uprooted hardpan, the rippling wind, now and then a wheeling bird, the flat deck of clouds matching the flatness of the land below. We can doze, awake again, and pick up the story without a seam. I awake and it's become all nodding grass, dark-green below with awns of pale-green dipping and bending. A swath of this pale color bands the landscape far away toward the horizon and it's extinguished by the huge cloud shadow.

Somewhere west of Loongana still on the plain, the train stopped at what the announcer said was an old World War II prisoner of war camp . . . perhaps at Kybo south of the tracks, which shows on our map as a small red square. What a place for a POW camp. Let the prisoners wander and show up for meals, with no water. How could anyone escape?

We approach the end of "the long straight" at Haig, the place where the track bends about 20 degrees to the N.

The low scrub is creeping in, pocket by pocket, meandering watercourse by meandering watercourse. Phylly saw some cows. The soil is a [?] and the place looks beat up, grazed to the bone.

Now I see a windmill a mile or more away, and a truck, bluebush, [?], fences, no bunchgrass—the hard rusty earth showing through.

Next come Rawina and I believe we stop for a few minutes. The Nullarbor looked so healthy, if spare, two dozen miles back, and now it looks beaten and tattered.

Gradually the forest thickened and darkness came, rose light through black eucalypt limbs and then darkness.

After dinner (much good food all the way, good wine, good Emu beer), a fine conversation sitting in our cabin with Bob—retrospective of our careers. How fortunate we felt, how satisfied with what it had been, and with our families.

The train pulled in at Kalgoorlie, a gold town (20 tons of gold last year from open pit mines)—a walk around the town, few people out, not many cars. We drank at the bronzed Paddy Hanson who discovered gold, made our way back, and are off to Perth, which we reach tomorrow morning at 7 AM.

September 15, 1991

Perth, Australia

Dawn came some distance outside Perth in the rolling hills of wheat and sheep farms—well tended green and dotted with newly shorn sheep. Most of the eucalypts and scrub are gone, except an occasional tall clump or a hedgerow along the road's edge. Finally, an hour or so late we pulled into Perth Station, unloaded our bags and were met by Geoff Shaw, Bob's friend who runs education efforts at the National Museum of Western Australia. We went to his nice house, met his wife Jill and daughter Jan.

We had a nice visit at their nearby home, a homey place surrounded by a splendid garden of all sorts of plants, exotic and otherwise. Geoff trotted out books about this and that question we had. I asked him about my usual questions—the hawk man who is seeking to control starlings at the border. He told me that the Board of Agricultural Protection were shooting starlings and English sparrows with a troop of people. He wasn't sure if they employed the Hawk Man, or if he was real. A call should settle the matter.

I asked about camels. Yes, he said, Australian camels were abundant in the outback and being exported to the Middle East. The Middle East camels often carry camel syphilis and Aussie ones are free of it.

He told me of a giant meteor that was discovered on the Nullarbor—the Mundrabilla Meteor, found by surveyors in 1966. They saw a big lump on the flat land and when they investigated, it was a 11-ton part of the meteor. Later they found another piece weighing 5+/- tons that was sent to Adelaide. When sliced they found the characteristic Widmanstätten figures of iron meteorites.

There have also been considerable tektite finds on the Nullarbor. An asteroid hit the land and showered up glassy droplets in all directions, some like buttons and some with collars and other forms. Others occurred near Birdsville and Inaminke.

Geoff said the Nullarbor was 300-m-thick limestone, Cretaceous at the bottom and Pliocene/Miocene at the top. It's bottom margin marks the place where Gondwanaland split away to become Antarctica. The great crack marks the margin of the South Australian Bight where the land left Australia behind.

He told me of giant sinkholes and limestone caverns of huge size.

We check our reservation for a van and will pick it up tomorrow, spend the day here and then be off on Tuesday to Monkey Mia to the north.

It's been raining on and off today. The wind whipped across the Swan River as we drove around the broad body of water, looking at the broad vistas, houses, skyscrapers downtown—a lovely, clean town.

Back to the hotel, to let our lunch settle a little before we think further about food.

Finally we did go below for a good, if modest dinner, and much conversation. The Bloomes are waffling and may stay with our great venture to the south. I hope so. They're grand company.

September 16, 1991

Perth

The day was spent going around Perth, getting maps, finding out about starling control, visiting the museum. I sent my respects to John Bannister, who is director of the Museum of West Australia. He seems to be in committees most of the time, dealing with about 200 employees, and his IWC affairs. I didn't bother him—just left my respects.

We got a van and found out that there is now not a car to be had in Perth.

There is a big rally here. Sports are much bigger than the fate of Russia, Gorbachev, and the rest of the world. The Australian football team (the Hawks) did a number on Adelaide and now go to the finals.

Phylly had a long walk through the botanical gardens while we tended to the rest. Lucky to get our van, a six-seat Toyota with a roo-guard (bumper) and good luggage space.

We leave for the north tomorrow and will take a couple of days in the process, and finally heave up at Monkey Mia in Shark Bay, where I go to work. We'll visit some National Parks and see the stromatolites at Carneva in deep, saline Shark Bay and then head back on the inland road. Then south.

I found out a lot about starling control by calling the Agricultural Protection Board. I talked to Greg Pickles who is in charge of the starling program, which seeks to keep the starling and English sparrow out of the agricultural areas of west Australia. Greg felt they were succeeding. He had taken the offensive. Old efforts had established the West Australia-South Australia border as the battle line. He said: "Let's go gettun earlier, in South Australia before they even get here." So most of his work is there. He's established three control districts and knows where there are colonies. Then he and four men go after them with mist neets, cannon nets, and traps. I failed to ask him about the falconer, feeling a little silly about it (which is silly). He said he'd worked at UC Davis with Dr. Terry Salmon. He will send me a report through about 1986-7.

Thence back to our friendly, gracious little hotel by the park. We waited a long time for our free bus (free within the immediate Perth area). Bob took the wheel of our van and we went to dinner in [?] at a place called the Oyster Bed—on pilings over the estuary. Very pretty. The food was cutesy-poo and difficult to find a simple entrée. I ate oysters.

Back to the hotel.

September 17, 1991

Enroute North from Perth

We ambled down to breakfast, hauled our luggage down, ate breakfast, said our goodbyes to the pleasant staff of the Hotel Sullivans and shoved off to the north, Bob at the helm of our six-passenger Nissan van. It takes all of our luggage and leaves us a clear seat each, though with my gimpy knee the foot room on the middle seat leaves a good deal to be desired.

We traveled up the Swan River and inland to the Brand[?] Hwy. north, which took us out of town and into sheep farms dotted with eucalypts, green, green wheat fields, yellow with a pretty little daisy. A broad swath of bush accompanied the road on both sides and was alive with blossoming shrubs and animals. Phylly knew nearly every one, from a lovely little yellow orchid to the banksias, kangaroo paws, *Lechenaultia*, and dozens more. One new to me was the smoke plant, a curious bush whose stems were covered with a heavy tomentum with a tiny flower at the apex of each stem. There were two—one very white, the other somewhat less so. I'll bet they are pollinated perhaps by moths after dark.

Place names here are full of aboriginal words—Pamparup, Nerragup, Boongarra, etc. The farms grew larger and houses fewer. Some of the fields had emus "grazing" or at least searching for food, and we saw the occasional kangaroo. I'd think the scrub would be hard to hop in. It's a very dense equivalent of our Mediterranean scrub.

We are led to a cemetery out of Gin Gin where Ray Colett had told Phylly he would find *Anigozanthos*, the kangaroo paw. What a remarkable plant. It is a tall (1 m.) plant with a gaudy green, yellow, red, and black flower and red stems. A bird flies in, perches on the stem to sip nectar from an ovary set deep down a cleft. Overhead a rake of anthers pushes yellow pollen onto the bird's head. These plants occurred in three main

kinds in the cemetery—the main, tall one; a low, red one; and an orange, low one. Many other wildflowers were scattered among the bases of the larger flowerers—a brilliant and curious garden!

Down the road we went in our comfortable van to Nambung National Park, site of a remarkable collection of travertine pinnacles and a dense flora adjacent to the beach and blocked from it by big rolling beach dunes, crystal white and full of white fossils. The whiteness, I suspect, is because of a lack of feldspar as an iron source.

Spinifex, black boys, a curious relative of the lily, were scattered everywhere, and I am told, in some places in the outback, become dominant. It's in its own separate family—something like Xanthorreaceae, in honor of a yellowish gum secreted by the plant that can be used as a kind of hard glue for sticking implements together—stone axes, etc.

They stand up on a thick black trunk, 18 in. in diameter or so, and up to six ft. high at times, crowned by a radiating tuft of thin, sharp-pointed leaves . . . a landmark Australian plant.

At Eneabba we passed a major titanium source—in rutile sands. TiSO_4 ? I also used to love to peer into rutilated quartz crystals, the long amber crystals of rutile shooting through the clear quartz.

We cut off the main highway and headed toward the beach and Nambung National Park. A dirt road led us through the rich scrub back of white, white beach dunes. Phyllis was in her element as many of her old friends from the Arboretum were in bloom. the road took us to the pinnacles, which were ranks of tufa castles set in a saffron-yellow sand. I could locate the central water tube in most of the castles. All this runs counter to the official explanation in their handout—which seemed to miss the water, algae, precipitation [?] story that is likely to have been the case.

We headed through growing darkness to the wheat and fishing port of Geraldton, set on a peninsula, just inshore of the Albrojas Islands and reefs where the rock lobster is fished. Finally we reached town, and quickly turned off at the Larcoola Hotel and Caravan Park, where for \$50 base cost, we rented a cozy little house that took care of us all. Once we were situated (good we called ahead—there was no space left . . . The Chief of Police was using a house with no water) We all headed off to a local tavern where in back they ran a fish restaurant. We had the best dinner thus far in Australia—garlic prawns (a garlic sauce made with cream). Then off to bed, Ginny on a cot in the living room and the rest of us in two bedrooms.

September 18, 1991

Australia, West Australia, Kalbari (enroute)

A good and inexpensive sleep, a shower, then K. Bloome presided over breakfast, which he extracted from a great mysterious bag he is carrying—toast, coffee, marmalade, and what else? Then we were off up Banks Highway North.

The road takes one up past vacation beach homes, big grain silos, and out into the wheat fields and bush. It seems almost indiscriminate what land has been cleared and converted to grain and what is left native. The more I see of the latter, the more it resembles our chaparral in structure. Shrubby, dense, wood microphyllous plants often with low annuals back in amongst the branches of the perennials. My, what diversity! And essentially everything native to Australia. Except around habitation when many

exotics are obvious—bougainvillea, umbrella trees, oleanders, etc. I've seen or detected no introductions out in the scrub.

The road edge effect is very strong. I'd guess the stature of shrubs within about 10 m of the road are 3x as high as those beyond. I can't be sure but the species list seems to be larger, too.

Up the road a piece we came upon a big hilly field, a couple of hundred acres, I'd guess, totally dominated by salvation Jane—all around a lovely little pond, that reflected the blue of the flowers and became little azure gems. We got out to photograph and I was able to key it down to family—a hydrophyll is my guess, dark azure and purple-blue flowers in scorpioid cymes. Introduced? I dunno. Bob says that local lore has it that in bad times stock will eat the plant.

Grain is the big thing here. Our farmer's subsidies are big news here. We heard about Washington state, what was happening to corn, but very very little about the world at large, even though the USSR and Yugoslavia are being remade.

Up Gib Gib hill to Kalbarri National Park, a vast, rolling plain clothed with scrub. We stopped along the road a good many times to check out the botany. We saw so much. A big yellow *Grevillea* nodding on long stems, a dark-blue fringe lily (*Pattersonia*), a curious *Darwinia* with its flower head lying like a frying pan on the ground, the saintly little cypress pine *Callitris glaucophylla*, a fire-intolerant species that persists where fire can't get to it.

The company is fine. The Bloomes are soaking it all up in many dimensions and are of wonderful good spirits. Kenny is always caring for us in various ways and ready for every new adventure.

Bob and Ginny are both full of interest about the world we pass through and good company. I enjoy seeing little artistic things with Ginny—patterns, clouds, colors, imagination, and with Bob the landscape, its history, all the little foibles of the people, the signs, the land.

After visiting a bend in the Murchison River, incised bends down into ancient Cambrian and Silurian sediments in the ancient rolling landscape, we headed for Kalbarri for lunch—one gal did everything and it was good.

Now it's time to hit the trail to press on the six hours of driving we have left. It's low, rolling wheat land and scrub.

What do I want to learn at Monkey Mia?

I want to interview Jane and Andrew Richards and here are some questions:

- 1) Is the interaction between wild dolphins and people working?
- 2) What are problems?
- 3) What motivates the dolphins?
- 4) The people?
- 5) How much of the school is involved?
- 6) Dangers to either side?
- 7) What interest do you think motivates the human visitors?
- 8) How big is the local population of dolphins?
- 9) Who comes in?
- 10) Recount the history of the Monkey Mia dolphin-human interaction.

- 11) Talk about family interactions:
 - a) mother-young
 - b) food-sharing
 - c) exchange (do they give us things?)
 - d) male role
 - e) female role
- 12) Sponge behavior.
- 13) Fish capture and handling.
- 14) Die-off of dolphins.
- 15) Annual cycle.
- 16) Protection of animals.
 - a) What do they have?
 - b) What do they need?
- 17) Are more Monkey Mia's a good idea. Bunbury.
- 18) What do you expect to investigate? What have you learned?
- 19) Ethical questions.
- 20) Is Monkey Mia valuable? Why?
- 21) How do you feel about the question of dolphins being high-order mammals?

I asked many of these questions and found Janet Mann (Of Georgetown University) and Andrew Richards (University of Michigan) very much into their research. They didn't seem to be much engaged in the larger issues of conservation, public values, social attitudes, etc. Just like researchers everywhere. Young and mostly an island of ideas within the larger flux of society. They were well engaged in the dynamics of their dolphin population and asking questions within their paradigms.

Janet is both child psychologist and primatologist, and Andrew now a solid behaviorist. I tried for a while to find out about people's attitudes and the equation of exhibit versus this sort of interaction and didn't mine loose much ore. So, I switched to biology and found them looking at roles in dolphin society, thinking about animal networks over considerable areas of the sea, and the like. The underwater viewing is rather poor here though out to sea a bit it might be better. Only a handful of dolphins come in and some of these have been at it for years. Holeyfin brought her two-months-old baby in. It was a bouncy little soul, often wandering a couple of dozen meters from her. She seemed not to interpose herself between it and the people. Others came in including the pushy Nicky and others I didn't know.

The habituation is very limited with the lone population of a couple of hundred animals. The wardens frown on regular feeding, or habituation, not wanting to "lock the animals into this relation." They worry that we are an unreliable companion in such a relationship—like feeding chipmunks. I doubt that this is a real problem. The warden lined up everybody and pushed them back (with words) into shallower water, on the excuse that it induces the animals to come closer. I thought it was to keep her from being forced into water up high on her waders.

Holey Fin swam along with her, habituated as could be, turning on her side, probably looking for an intermittent handout of fish.

Nonetheless, the people did experience the animals and it was thrilling to some, especially I think to some women. I saw many hands outstretched and waiting, full of

anticipation, and the wonder in the eyes of some children. Conversely, there were some near, up the beach, who looked profoundly bored.

Christine was thrilled to touch one. My sense is that the experience is rich for some—a touching of a human to a friendly wild animal, unthreatening, unafraid and accepting. I even think the cultural dimension comes through for some—that these animals have chosen to come to us and not necessarily for food, but also because we are welcoming and open to them . . . their gift to us across the huge phylogenetic barrier between us.

The very lack of spreading of this tendency, I think, reflects badly on the means of cultural transmission in these animals. Why don't others learn? Well, Andrew says he thinks ownership of a "territory" to the handouts may be involved. A new animal joined the beach group a couple of years ago and there was some evident aggression. Most of the animals are Holey Fin's family.

I'd guess that if it is dolphin ownership, others will replace them if they die.

In the morning I interviewed Andrew Richards and Janet Mann about the dolphins. She is a new-minted Animal Behavior professor at Georgetown University.

Then, this afternoon, Andrew took me out on the boat again to see if we could see the sponge carrying dolphins and to watch how he does his work. Janet was in another boat with her assistant, Carrie Ann?

We boarded an aluminum skiff equipped with radio, oars, and fathometer, and took off out to sea. The bay is predominantly shallow with very extensive grass flats, channels in between and deepening slowly.

The dolphins are very scattered—a few loners, but mostly small groups of twos or threes—and fairly far apart—often a mile or more. Far out (3 miles) we came upon a crab trap boat laying double-buoyed traps over a grass flat. In this same area we came upon a loose assemblage of about 15 dugongs; they looked light, rusty, sand-colored and came remarkably close to the boat at times, swimming down a few feet, fairly close alongside and veering to surface. I saw adults and young. Their curious flattened snout and lack of a fin is very evident, and often enough I could see their very broad flukes slide right up to the water's surface as the animal's glided along. They blow a bit and can swim quite fast. Once we shut the engine down and one circled us curiously—15 yards out. What a pleasure to see a healthy population of this beleaguered species here in Shark Bay. It is, I was told, one of the healthiest populations of its species.

Richard Conner had left instructions for me to be shown everything. He told Andrew and Janet to be sure I was taken on a longitudinal follow, where you follow a single animal for a time and note behavior and associates. Much like a focal-animal method. We didn't do it. I begged off, pleading my fragile knee. I took an extra pill before going out and it pretty much saved me, I think, as I could feel twinges coming on.

To return to the lure of Monkey Mia. First it has received a lot of publicity and has become a destination. The run of the public now comes on tour buses and you get all kinds, especially a lot who are "tourists," who are spectators but not participating, even including not thinking much or even feeling much. I suspect many are not used to feeling, to thinking, to wondering. The Booboisie, perhaps. They probably aren't much engaged in issues about the degradation of the earth or the problems of wild animals. Others worry, but their sights are narrower, more trivial, closer to the little things in their lives. Then there are the young, into young things; girls who look laterally past the dolphins out

there to see if they are being noticed by the boy they saw. The juices run strong but not about the fate of their world.

Then, there are those who care terribly—bless ‘em—those that reached out in anticipation to these wild beings, who somehow took them on their own terms and came back for more. Holey Fin works it like a paper route. Her route. And she introduces her children to it, a family of cobblers, or the Great Zampeses, who were all aerialists. It’s a living. What does she think? The idea that they are not being conditioned seems ludicrous to me. We set rules, the dolphins get food.

So how does it stack up against an oceanarium show? There is the great plus of the animals being real wild animals coming in on their own terms, of leaving it up to them when to show and what to do. The visitor might or might not have contact, so contact becomes precious. The place is beautiful and the nearby sea a wild place of rays, fish, dugongs, turtle grass, etc. The beach is lovely. The education-protection message is generally well done.

The format allows visitors to imagine mostly about who these animals are.

It’s very simple so far. You don’t learn much about dolphins on the beach, though there were good posters in the interpretive center.

The scientific work I found rather bland and predictable and seemed not to use the beach situation very much. It was mostly a field study of accessible dolphins from a convenient place. To be sure they were following the genealogy and to some extent the behavior of the beach-frequenting animals.

September 20, 1991

The last morning. Clear, quiet, crisp, and lovely—the precursor to the warmth of the day. I walked down to the broad amber strand before my morning cup of coffee. In the morning light the hills shone almost tomato-red through their low clothing of scrub. The rolling land ended at the beach far to the north in a series of bluffs already distorted in the sun and then dipped into the haze and became a line or the horizon. Scrub formed dark gray-green patches interlaced with red over the low hills.

A scattering of people were already at the beach just north of the little pier, wading into the water and Holey Fin and her new child were there, too. Hands reached out in the search for connection.

Out past the thin crowd of dolphin-watchers, half a dozen small boats hung at anchor, the water still as glass around them, their retrieval lines, snaking ashore under the slowly moving dolphins.

This low land is exposed at every point of the compass and when the wind comes in from the Indian Ocean there is nothing at all to stop it, which it may do for weeks at a time. Right now I can see out past the glassy beach shallows to a dark band of grass, followed by a band of blue where the sponge-carrying dolphins work, and then still farther another dark grass patch where we had encountered dugongs the day before.

Sponge-carrying dolphins for some unknown reason, dive, retrieve, and carry sponges in their beaks. No one knows why.

A big, gracious caravan park has built up north of the pier, housing at least 200 people at capacity, featuring served meals in a big thatched ramada (the sides now closed by plastic curtains and heated by a big fireplace and hood).

A snackbar, a little store, and more, crisply run by a competent young man named Leith for the entrepreneur in Perth.

Denham too has felt the presence of these few dolphins. Once a sleepy fishing port, it now caters to tourists mostly and one can get an elegant sitdown meal with fine wine. Tour buses park end to end on the streets.

A day of goodbyes at Monkey Mia and travel. Many things happened in this simple scenario. We checked out, paid up, said goodbye to Andrew and Janet, and stopped long enough for me to write a description of Monkey Mia, which I had forgotten to write when I came. I photographed the Indian Ocean pelicans and off we went.

Before Denham we came to the Nine-hole Golf Course, which was very dessicated and the holes were sprayed with some kind of oil instead of green grass greens. As I stepped across a little band of scrub to get onto the fairway, I sighted a snake 18 in. long, tannish brown with blackish mottlings on its head and neck. It was eating what looked like a cigarette but which proved to be an insect, which the snake finally released and which flew away. The snake then reared up its head three inches above the ground facing us. I gave it wide berth as I suspected it was a brown snake, and therefore very venomous, even at this size. Sure enough, when I ran it down in my limited books it came out "West Australian Brown Snake, the world's second or third most venomous snake." It is supposed to be very aggressive and to strike two or three times in lightning succession, so fast one can hardly avoid it . . . like our racers. We gave it wide berth and drove on, later reading about a snake collector who had been bitten by a snake about this size and almost died—unconscious, great difficulty breathing, clotting destroyed . . . an awesome little beastie.

Into Denham where we straightened out things about our rental with Sandy Cooper, who turned out to be a nice guy. Ken got his deposit back. Then we got our act together and drove off down the road past "Useless Loop" to Hamelin Pool and Station. A dirt road takes off through the scrub toward the broad, arcing beach deep in the inner arm of Shark Bay. Soon it comes to the station building, with typical peaked galvanized roofs and screen porches, water tanks, and windmills, through ranch gates—metal mesh with bails for closing and down a dirt track to back of the beach dunes where one comes to an old (1884) telegraph station in which the station owners had managed to keep a stromatolite alive—under a grolux tube with an artificial tide.

The stromatolite is a castle of calcareous gravies and gelatinous blue green algae that form very slow-growing layers—less than a millimeter per year.

The algae bubble off oxygen and little fish, like larval snappers, clean off encrusting green algae that could shade off and kill the blue-greens. What did this before fish were evolved? These stromatolites are found in rocks at least 3.5 billion years old, along with other perhaps even more ancient forms, both of which must have been involved in the production of the original oxygen-rich atmosphere. We could see the algae bubble.

We hiked over a beach berm made almost entirely of a single pelycopod—a little ribbed shell. It dies and gas from decomposition causes it to float and it is blown ashore to be piled in windrows on the beach.

It was so thick and deep that beds, many 40+ ft.-thick had formed a pure coquina, which had been cut into building blocks at one time until a considerable quarry had been excavated. Lovely stuff, but not very strong.

Out beyond, in the intertidal, were the stromatolites—curious, knob-like, blackish castles up to a yard or two in diameter and perhaps two ft. high, surrounded by shallow, very saline pools, teeming with these little silvery fish and little else.

These stromatolites live only in places where hypersaline water occurs, apparently to protect it from competition and hence allowing their persistence in this complex modern ecology.

As we hiked over the berm and back down by the telegraph station, there on the road we encountered two lizards in combat. Each was on the order of 10-12 in. long, with a rather large head like a collared lizard, a dorsal-scale ridge colored tan like the sand. They had long, tapering, cylindrical tails. Each nipped at the tail of the other as they circled. Every now and then one would reach out toward the tail of the other, whirl in the air, with the effect that its tails wing around out of reach of the other just as it bit. This was very fast—a fraction of a second—and then they moved in to circle again. Finally, slightly smaller than the other [?], vanquished and moved away, still facing its opponent, who pursued. I think they were *Agamas*, but don't really know.

The hormonal rush gripped both of them, and their fight went on even though I was constantly photographing them. Unfortunately, I was having film-speed problems and I much doubt that my pictures are any good, even of the stromatolites. Sob! Sob!

On we went down to the main highway and then south. Our destination, Kalbarri, where we had rented two “two-star” motel rooms over the phone. Two star means there is a broken bulb in the bathroom light.

At Pindadano we came into mulga forest, having passed some ancient sand ridges clothed in a jagged fringe of cypress and pines.

Then as we approached the Murchison River, the low forest grew denser.

Spotting a little critter edged out onto the road, I said “Tiliqua! Skink! Pinecone Lizard!” It scuttled off into the dense bush before I could respond.

We cut off toward Kalbarri where we had a two-star hotel reservation (two rooms, three families) and down the road into Kalbarri Park in the late afternoon. We cut off to a lookout over the Murchison River Gorge. The ancient plain all covered with a rich scrub finally wrinkles a little and one can see the winding drainage of the Murchison cutting down through the red Silurian rocks toward the Proterozoic below river level here. An ancient winding course is still followed, now deeply incised in the land. Not far below us it flows into its gentle estuary at Kalbarri.

On the way back I saw a violet and black snake-like animal on the road and we stopped. I think it was a specimen of the endemic family of legless lizards, the Pygopodida. It had a very elongate pointed head, and I believe I could detect that it had once lost and regenerated its tail.

It thrashed from side to side ineffectively, very unlike a snake. I stopped hassling it and we drove on.

Mt. Pinatubo had thrown dust into the atmosphere, giving us a lovely red sunset which silhouetted grevilleas and black boys against the sky, precise filagreed black against the deep rose red. Elegant!

We holed up in a motel attached to a bar, sought out dinner, and went to sleep. I spent some of the night mulling over finances for the trip, in the dark—a fruitless activity.

Australia Caravan
September 21, 1991

We drove south along the coast, had lunch in a tea room at Northampton and headed inland at Geraldton, into the wheat belt. The country is an ancient landscape of low, rolling land, and it is ideal for wheat. Most of the land is cleared and solid grain pasture with big flocks of sheep. Most of the scrubland is in narrow bands along the roads. These are about one car wide with broad dirt shoulders for passing.

We looked at a tiger snake, dead on the road—about two ft. long (they reach 6½, I believe). This one was blackish mottled, rather thick, with a rather small, blunt head. It was still twitching so I was very wary with it. I pried up a lip and could see a rather small fang. Then we were on our way.

The Bloomes had come up with breakfast in the room so it wasn't until lunch that we stopped at a tea shoppe and then cut inland.

We passed some blue-tongued skinks[?] on the roads—and then drove through flocks of gullahs—lovely pink and whitish parrots, and then what may have been a flock of cockatiels and another of a big blackish parrot that I think was a white-tailed black cockatoo. Lovely big birds with a curious slow wingbeat. We found Phylly's low-growing, wild pomegranate in full bloom.

The land near Three Spring and the Yarra Yarra Lakes turned low, with salt, lakes, and pickleweed flats and stands of dead trees, all interspersed among the wheat fields.

The road cut through vast wheat fields, up over low hills and down to Carnamah alongside the Yarro Yarro lakes, which appear to be low, saline, ephemeral lakes ringed by salt-tolerant plants like *Salicornia*. We came to the little town of Carnamah, which seemed like a remnant town of the time when many people were on the land instead of a very few absentee landlords. The result is seedy towns just hanging on.

I spotted the hotel, a big two-story edifice with eucalyptus stairs out back, cavernous and dark halls, and spare rooms upstairs, a 1940s picture of Esther Williams hanging slightly askew from a bit of moulding, running seven ft. above the floor from which all pictures were hung. Esther *was* beautiful.

Our rooms had a single unshaded bulb, two single beds, an armoire with a sign inside that said "Stomp out Violence," and a door onto the second floor verandah that we couldn't lock.

Phyl's and my beds were OK, but apparently the Bloomes were sway-backed disasters. Not much sleep resulted.

The dining room was crowded and a single 30-year-old woman, frazzled hair in her eyes, cooked dinner for about 20 of us. She cooked double-thickness T-bones, one of which I had. A bottle of claret, and then a walk around town, such as it is, a stop by the bar with its pool table and TV showing the Aussie football championship, and then bed.

September 22, 1991
Australia, W. Australia, Busselton

We rose at 7:00 AM, scurried around paying our bill to the owner, a Vietnam vet, who moved out of Melbourne and loves it here, and coaches the local kids' football team, and does everything. The motel was full of Jehovah's witnesses, which he did not like, hence no rooms for us last night.

South we went, the countryside getting greener, the trees bigger and bigger, streams more and more evident, ponds here and there, and stock everywhere. By the time we skirted Perth we were in lovely eucalypt forest in bands among the fields, the marri, which looks like a big valley oak (*Eucalyptus calophylla*).

Everyone was a little tired and snappish, the Bloomes were puffy eyed, and Ginny seemed more on edge than usual. Phylly made a matter-of-fact assessment. Something like, "Everyone's on edge today. We better be careful or we'll be angry with each other from here on out." It said what needed to be said and we settled back.

We cut off to Bunbury to look for the wild dolphin place. Like Monkey Mia it had been started by a woman who took to feeding the animals and finally had them coming in regularly. Then began to falter because of the cost and the commitment. The Lions Club, sniffing a tourist attraction (they could see what was happening at Monkey Mia) stepped in to help out, but she was a renter and lost her lease, and then she died, in about 1979.

The dolphins began to wander off, and then in 1989 it was picked up again by a couple of dolphin handlers from a European oceanariums (Uridson, Germany and Luxembourg) who had come out to work at Atlantis University of Perth, Stephen and Jenny Honnor. A Dolphin Trust was set up (these animal things are not non-profit here in Australia), and they have been here ever since. Steve told me he thought this kind of interaction between people and dolphins was much better than an oceanarium.

He and his wife Jenny had supported the effort to bring the dolphins of Bunbury in to provide an exhibit. My guess is that they were sincere about their concern and care for the animals and also that they hope to build a tourist attraction as exists at Monkey Mia. They rather soon became enmeshed in two very different social forces: the fishermen, who think the animals take their fish and don't much want them in the harbor; and the arch-conservationists, who don't want to have the dolphins interact with people at all.

In between are these two, trying to provide an exhibit that tells about real wild animals instead of captives. They are pulled this way and that. Two dolphins (?) died and the arch-conservationists blamed it on the food they fed. In October last, they stopped feeding. The result is interesting. Attendance at the beach did not stop. Instead, they saw many dolphins who hadn't come in before out of the hundred animals they know. And they stayed a shorter period of time each day, usually in the morning. So, it seems probable some subset of the population claimed the beach for a food supply and kept the others, somehow, away.

But when food stopped, the attraction between dolphins and people did not go away. Interesting!

They have set up a trust of local people who help interpret and last year about 20,000 people stopped by.

We said our good wishes and goodbyes and left to Busselton where our hotel is located. I had John Dory for dinner—excellent firm white meat probably from New Zealand.

To bed.

September 23, 1999

Albany, West Australia

We stopped in to Busselton to exchange money and then made our way south along the coast, to the Margaret River, thence inland to the karri and jarrah forests. Actually the latter was much in evidence earlier, up along the Bunbury coast. Had a big lunch at Pemberton, thence through the karri forests and down along the coast to Denmark and Albany, where we stopped at the Dog Rock Hotel for a room and dinner, the last before Ken and Christine Bloome fly out tomorrow for Perth, thence to Melbourne for the football finals—a very big deal here.

Our trip took us down through the increasingly well-watered country at the extreme SW. The rain comes twice a year and may reach 80 in. in places. There are many streams, now; shallow ponds in green fields, melaleucas along slow-moving sloughs and ponds; and inland, a forest clothing the low, inland range of hills. Many streams are dammed and water everywhere abundant. The jarrah, a lovely red wood from a dark-furrow-trunked tree; tingles [?], large eucalypts; and then the giant statuesque karri, an elegant tree with a huge, mottled white and gray trunk, and often with its top blown away, presumably by lightning. Karris reach over 200 ft. (90 m.) and maybe 7-8 ft. through The wood is prized for structural timbers, because of its straightness and size.

We skirted along the shore at the Margaret River, forest opening to vineyards, and pretty streams and bluffs. White sand beaches in coves appeared now and then, and we could see surfers out in the curling waves.

It was rather a snippish day with Bob and Ginny at it, and this setting the others of us on edge. It's the clash of tempers—Ginny, artistic and loose, and Bob with everything figured out and organized. Ginny finally spoke up tearily and it subsided, to all of our relief.

We cut inland at the Brockman Road, traveling through a eucalypt forest with a dense understory of many perennial species; black boys; brilliant peas; proteaceous species; droseras on the ground, or some times appearing as climbing vines, their viscid insect traps gleaming with motes of brilliant light where the sun was caught. Many myrtaceous shrubs were there, too. Some of these were in flower—orange, red, deep deep blue, yellow, and white.

Even here in this deep forest, one found kangaroos and these often found the road and were killed. The toll is extreme for all of Australia, I would guess.

At Pemberton we stopped at the Shamrock Café, where we found Marron advertised. This is a huge freshwater crayfish, the size of a small California lobster. Some of us ordered it at \$20.00 a plate, to see how good it was. As good or better than our California lobster, I'd say. Phylly imperiously announced it wasn't up to *Homarus*. They raise them in a series of ponds. He talked of momma carrying eggs and spawning out a thousand young or so, who are put in big pools and fed up on pellet food. He also mentioned that when they get to size, they fight and males and females are separated. It takes seven years to raise up the size we were eating. He was a fine Irish guy and very knowledgeable. He was a refugee from town and doing a lot of wood turning using mostly the lovely jarrah wood. They had set up a nice gift shop which we perused. I was tempted by some of his wooden bowls, but didn't bite.

On we went toward the west, through lovely mixed karri forest. The jarrah here is being attacked by a fungus, and large tracts were infected.

We took a loop through giant eucalypts just at sunset and cruised on through the dusk and then the dark, seeing the lights of Albany looming under the overcast sky. Albany is the big town hereabouts. We've been quoted populations of 25,000-45,000. I'd guess close to the latter. We found our motel at Dog Rock, which is a big, sea-lionish or doggish rock across the street.

Then followed dinner, our last with the Bloomes, as they fly out to Perth tomorrow. We had some good Aussie wine and I had baked whiting with almonds, which was quite delicious.

To bed. My knee gradually, gradually improves.

September 24, 1991

Australia, Western Australia, Gowangemp

We decided to leave Albany because a coach's convention had snapped up all the rooms. I suggested we outranked Lacrosse coaches, but to no avail, and so we took the Bloomes to the tiny Albany airport, inspected Torbay Bay, then took off through the back country toward the Stirling Range. It was an elegant day.

We first drove out around the harbor at Albany, out where we could see over King George Sound.

Low, almost barren granite islands dot a huge harbor opening toward the southern sea. We spotted what I think was southern right whale moving slowly along, and a single bottlenose dolphin close alongshore. Then we headed for Torbay Peninsula, driving along swampy ground, all sedges, paperbark melaleucas, and open fields dotted with big flocks of newly shorn sheep, white as bed sheets.

Finally, we found a road off through farms that led us to Cape Home National Park, a little point of granite, clothed in native scrub, of a great many species, many in bloom: banksias, peas, orchids, daisies, and various [?] genera.

The park is really hidden. We found an unmarked dirt road in about the right place, turned out toward the peninsula, and sure enough, it became the main National Park road, and shortly took us up onto a rather high granitic peninsula, usually heavily clothed with a very diverse scrub, much of it in bloom. I can hardly list all the plants, but it ranged from tiny orchids to flowering banksias. We drove to a lookout high up over an absolutely white beach, the sea a dark jade, and then farther offshore darker still. It was a dripping or cloudy day that turned sunny later on as the sun burned through. I walked down a trail that cut across the face of the hill, usually waist deep or deeper in shrubbery. Phyl was off on a plant walk of her own as I poked down the trail.

Soon I noted a brown snake about 18 in. long, coiled in the tangle 2 ft. off the trail. I decided to test out the ferocity of this snake. They are reputed to be shy and to fade away if undisturbed, but if stepped on or provoked to attack with ferocity. I felt safe because I had my cane and was a good 5 ft. from the animal on a trail on which I could flee, faster, I hoped, than the snake.

I prodded it and instantly it lunged roughly in my direction, darting from side to side. I fled backward in a spasm of motion. The snake did not follow but faded away into the tangled brush. A larger animal with more range would be formidable indeed, and this

critter gets more than six ft. long, as I recall and is one of the two or three most venomous snakes in the world.

Back at the car we loaded up and headed for the airport where we left Kenny and Christine awaiting a plane to fly to Perth.

We looked beyond to the jagged Stirling Range jutting up over the low landscape to the north. Our plan was to spend some time there looking for plants and whatever else showed, and then to head for Gowangerup where we had reservations in the country hotel located there. These hotels are all old and clothed in the little farming hamlets of their towns. They have a pub, darts, TV, etc., a dining room, and rooms upstairs right out of the teens . . . bathroom down the hall, an armoire, a lightbulb, a bed, a towel, a bar of soap on the pillow.

The road north from Albany ("Ahlbany") goes through large sheep ranches, green with grass, and fields of wheat seeming close to maturity, down good paved roads often lined with shrubs and eucalypts of various kinds. Sheep by the hundreds dot the rolling landscape with white.

We entered Stirling Mountains National Park, one of the biggest in W. Australia . . . a whole isolated mountain range of ancient rocks, very abrupt in places and rising to more than 800 meters on some peaks (Mt. Trio). Phyl drove us through the very diverse scrub and low eucalypt forests to cut off on the Mt. Trio road. It is a garden: flowering eucalypts, proteid relatives, brilliant peas, composites, orchids, myrtles.

We drove up to the base of the mountains at Mt. Trio and walked a couple of nearby trails. A swarm of bees filled the air with humming and various unseen birds kept up a constant chatter. The flowers come in red, yellow, very intense indigo blue (*Dampiera*), and a remarkably brilliant *Leschenaultia*, white and yellow. Phyl was in her element.

We backtracked and made our way up to Bluff Knoll, at the base of an abrupt, banded peak capped with clouds. At the turnaround, I learned about grass girls, a tall, columnar plant topped by a pom-pom of thin, drooping leaves, with four or five knoblike flower projections. Alongside it were black boys, *Xanthorrhea*, which have a similar black column but a long, tapering rod-shaped flower stalk.

We met a curawong—an icterid bird—black and white or gray, with a long, curving beak and a cry something like "Curawong"—an egg and hatchling stealer about the size and disposition as our crow.

Under a low eucalypt we found two gray kangaroos taking a rest, one was mom and the other a joey, but a joey so big I doubt Mom could carry it any longer. They were amazingly tame—taking a nap with long legs outstretched and dozing. I crept closer and closer until they filled the whole frame of my camera, then closer still, just a head. Still they dozed. Finally, not wishing to disturb them, I left.

As elsewhere, *Drosera*, the sundew is here in many forms, notable a cauline red one of four leaves lying right on the ground.

We encouraged Phyl to backtrack and pick up a road that cuts across the park, almost from end to end, to Red Gum Pass. Several stops later we emerged heading across the farmlands to Cranbrook and finally Gnowangerup.

After a long drive just into dusk, we arrived at Gnowangerup and found our hotel—another two-story affair plastered with Swan Beer and Victoria Bitter signs, entered, and found the place was full enough that we had been shifted around. Phyl and I

took a room in the old hotel, Bob and Ginny in the motel out back. There didn't seem to be much to choose.

These outback hotels are of a type—about turn-of-the-century or 20 yrs. later, they have a high-walled and windowed cavern of a dining room, pretty much the same menu—fish, porterhouse, shrimp, soup, some desserts, drinks, and friendly Aussies running the show with only modest help and usually trying to remodel but a long way to go.

After more dinner than we needed, we spent a little time in the bar gabbing with patrons—most told us how odd our accents were—and then off to bed.

September 25, 1991

Hyden, West Australia, Wave Rock

The road took us north past the salt lakes. They vary a great deal in color and transparency but most seem fairly salty. Bob explains that sodium salts cause clay suspension while if calcium is preponderant, the water will be clear. The lakes are often surrounded by the dead and white trunks of trees. One informant calls this a “seepage effect,” but I still don't understand how it works.

Rather frequently we came across tiliquas (blue-tongued skinks) in the road, either killed or ambling along. They fled at our approach but still seem very slow. I suppose they are above the size susceptible to most birds (how about the wedge-tailed eagle and the emu?). Anyway, we never saw a young one. It sounds like the marine iguana, which becomes almost invulnerable on land when adult, but is very wary as a young lizard.

We pulled into Hyden, which is a considerable tourist destination—the motel and restaurant being full all summer. We signed on for the buffet, which fed us and two busloads of tourists.

The rooms were nicer than other outback accommodations and more expensive. We just got in under the wire by signing up first thing in the morning.

It was 3 km to Wave Rock. The granite domes had been seen most of the last half of the trip up . . . low, smooth, with very little exfoliation evident (though some).

Wave Rock is spectacular. A real wave in granite 30 ft. tall, streaked with broad bands of iron stains, black, light-tan, rust.

Needless to say, I had to hang ten with my cane. I did Geriatric “Charlie the Surfer.”

We hiked up on top, seepages and ponds and a reservoir were there as well as an awful, unsightly cement and rock retaining wall all along the top of the wave. I'd tear it out and move it back 30 ft. where no one could see it.

I saw the 28 parrot—the Port Lincoln parrot, *Bamarchius zonatus*, whose voice and call is supposed to be like “28.” They are a beautiful green, black, red, and blue bird, said to be a mu-[?].

We walked down to the Hippo's Smile, a great rock like the open mouth of a hippo. Pretty good, I have to admit.

Phyl and I walked back through the scrub, looking at just about everything and getting nipped by mosquitos for our pains.

A cup of tea in the gift shop and back to the motel for dinner, a shower, and bed. Nice place, though pretty tourist-riven.

September 26, 1991

Australia, Perth

A drive through rolling wheat and sheep land, banded with eucalypts, through colonnades of trees, down along the sandy, wandering trickle of the Avon to the town of York. It is an old and restored town; the first such town inland (1830s), very quaint and touristy. We had lunch and moved on, driving over the rolling Darling Range and then into Perth where we holed up in the Sullivans Hotel again, a friendly and comfortable haven just moments from downtown Perth, a short free bus ride in fact.

We had a nice dinner with the Shaws, Geoff and Jill. He has been our local contact and source of information and help and very good he is too. She is a calm, cool head who watches his various antics (storytelling) with the same bemusement Phylly directs at me.

September 27, 1991

Perth

A day in Perth, nearly all up at King's Park, where they were having a wildflower show. It was quite a lot of fun wandering around among the mostly inside exhibits where they had collected a remarkable array of flowering shrubs and some annuals, orchids, eucalypts, mulgas, black boys, fungus, and on and on. There were some elegant paintings by school children in the 10-11 grades, some good enough for publication.

The park is very short on amenities in my view. Two trailers provided lunch for dozens and dozens of people, but it is an elegant and lovely garden, beginning with a parade between towering, clean trunks of lemon gums, a sculpture of Queen Victoria, reliefs of the Boer War, WWI, Gallipoli, including some canons from the very early 1900s, and magnificent sweeping views of Perth and the Swan River estuary and river. It is a lovely, modern, unrushed place, sparkling clean, a combination of a modern city and parks and water, bluffs, and at our visit blue sky, puffy clouds, and crisp air.

My damn knee was painning me and the events of last night—a bit too much wine I suspect, bore down and it wasn't until lunch that I emerged into the living, being grumpy before.

Phyl and I hiked down the bluff face on a nice, gradual, asphalted trail, which I managed OK, almost right to our hotel.

We said our goodbyes to Bob and Ginny who are off to dinner with friends. We won't see them in the morning as we leave very early, catching a plane that stops in Adelaide, changes planes in Sydney, and thence on to Christchurch, where we stay overnight, leave 8:55 AM and fly to Dunedin where I give a seminar and check in with Steve Dawson.

It's been a very interesting and from my standpoint, successful trip. Phylly has been enjoying herself fully, too. We landed in the midst of one of their best recent wildflower years and she was never at a loss for something of interest as we drove through the countryside.

Now we are off to the South Island, New Zealand, for a look at the Akaroa Peninsula and perhaps a *Cephalorhynchus*, though I think I will have to be fairly lucky.

September 28, 1991

New Zealand, Christchurch

We packed up and left very early. An uneventful flight took us across the edge of the Great Australian Bight to Adelaide, where we landed and thence to Sydney, a change of planes and to Christchurch in the late evening. We checked in at the local posh hotel (Park Royal) (with an interior glass elevator) for a few hours of sleep.

September 29, 1991

Dunedin, New Zealand

About 9:00 AM we flew down the east coast to Dunedin, a University town set in gorse-covered hills, with patches of cultured Monterey pine forest and sheep, sheep.

We rented a car at the airport, being warned not to go on certain hazardous roads and drove (Phylly did) the ten miles or so into town.

Dunedin sits on a nice deep harbor near the south tip of the South Island, has an albatross colony, and is the site of the old University of Otago, the southernmost University in the world. We holed up at the quality "Quality Inn," a nice place on Moray Circle near the center of town and then walked around town on a quiet Sunday—almost no traffic, took in the exhibits at the Otago Museum, and thence back to the hotel for a delicious dinner—thin-sliced roast eye of lamb (the fillet) in a rosemary garlic sauce, and thence upstairs to read about New Zealand. No bites on my suggestion of a show.

September 30, 1991

New Zealand, Dunedin

I'm sitting here in the morning sun, which is predicted to give way to showers later today, preparing to see Steve Dawson about the Hector's dolphin. Here are questions for him:

- 1) What is the range of Hector's in N.Z.?
 - 2) Is it threatened everywhere or are there enclaves where no protection is needed?
 - 3) What are the worst threats?
 - a) Commercial?
 - b) Sport gill nets?
 - Any hope to ban the sport nets?
 - 4) Does the species migrate? Why?
 - 5) Any thoughts on how the genus dispersed to its present range?
 - 6) Where are your opinions about what makes *C. hectori* so vulnerable?
- Echolocation?
- 7) Describe life cycle of *C. hectori*; age to reproduce, growth, fecundity especially.
 - 8) Social structure.
 - 9) Prognosis for future.
 - 10) Questions about boatman at Akaroa. Advice on where to stay?
 - 11) What future work have you in mind?

Phyl and I went downtown in the morning, and did a little shopping, she to look for a special New Zealand plant book and I to look for a tweed coat. We didn't find a book but we did locate an elegant Harris tweed from the Hebrides that fit just fine and is

nice and heavy. It should last through a couple of additional owners. I intend to fly fish in it.

I went to the Zoology Building next to the Captain Cook Bar (broken glass all over the street) and went upstairs to find Drs. Steve Dawson and Elizabeth van Slooten. They met me in Steve's office—a typical old academic's office with pictures of the fusty former deans and professors outside the door. Not a single "Far Side" cartoon.

I gave a seminar on our spinner dolphin work—well received, I thought—to about 35 staff and students. R. Evan Fordya came. Then I interviewed Steve Dawson and Elizabeth Slooten about their work with *Cephalorhynchus hectori* at Banks Peninsula. They are both bright, open, committed, full of vigor, and I found Steve to go beyond even that. He is incisive and snapping bright and well informed. My guess is that he's among the top handful. He deals both in ideas and data. His training is in bioacoustics of bird vocalizations (chaffinches). She is doing ecologic-behavioral thing and was also sound, open, and excited.

I will fill in a piece on my interview later on.

They drove me back to the hotel in a quite spastic Datsun pickup, reminding me of my erstwhile own green one.

Then Phyl and I had a little rest and went downstairs at 6:30 to take everyone to dinner. Those attending were me and Phyl, Steve, Liz, two students (Susan Smith of U. Canterbury and Jan?, who works on the *Tursiops* of Doubtful Sound), and R. Evan and his wife Marylin.

We had a quite elegant dinner in a place with no liquor license (you brought your own). We had a fine time. R. Evan continues to find amazing discoveries at the time of the Mysticete-Odontocete split and has a new and exciting one from the Seymour Peninsula of Antarctica, plus others—a small mysticete with an elongate trough-shaped snout. I found out more about everyone's work. Steve has developed a means of measuring sperm whales using two cameras on a base bar, he says accurate to 1%.

We talked conservation too and I found him subtle and far ahead of most people. He emphasizes the need to get ahead on conservation problems—not wait for action until a species is in extremis. This is his view about *Cephalorhynchus*. He asked if I had yet seen the gill-net conference report, and I said no. It may be home now. He said some panels besides the one we were on took strong to even radical positions about oceanic gill netting.

He told me of a million gill nets off the Indian coast at any one time and of larval forms being caught and scraped from fine mesh nets in the Philippines. In the face of the population problem, the cheap available gill net has become the instrument of ecological destruction.

They took Phylly and me home to a hotel after a while, and we were quick to collapse. I'm deep in Tom Wicker's book about the Civil War.

October 1, 1991

New Zealand, Christchurch

It was a blustery, blowy, sometimes sprinkly day as we drove up from Dunedin (Phyl did). The trip is through many small towns, miles of sheep paddocks, all green this time of year and sprinkled with white sheep and their lambs. A few groups of deer were

seen. The road crosses a dozen braided, cobbly, glacial streams and is otherwise very civilized. Very little wildlife was in evidence, a couple of possums, black and white magpies, gulls, English sparrows (big, fat, sandy ones), and a few ducks.

Phyl was tense in the new car whose width was greater than her own, and we were on the wrong side of the street. We had a flat in the blustery cold. Thank goodness no rain.

A little sleuthing and we found the hotel, where the gracious staff whisked us off to our nice room—two beds so Phylly and I can sprawl.

Tomorrow we go out to Akaroa.

October 2, 1991

New Zealand, Akaroa

We drove out around the two calderas that make up the Banks Peninsula. The bustling Christchurch was left behind, and we found ourselves bowling along next to green pastures full of newsly shorn sheep. Very tall hedgerows, as neat and trimmed as green walls, protected many[?] of sea breezes flowing over the long sandbar that defines shallow Lake Ellesmere from the sea.

To our right were the first of the two mountainous calderas rising just under 1,000 m high, that make up the Banks Peninsula. The first is [?] from the north forming Ly Helton Harbor, and the outermost from the southeast forming Akaroa Harbor. Both are long, fairly shallow channels on the sea passing in past headlands and bays to the very center of the long, dead volcanic cores. One figure I heard was that volcanism was active 5½ million years ago, or during the mid Pliocene.

Lake Ellesmere (Waihora in Maori) is a huge expanse of shallow, tan water behind a low beach berm that stretches out of sight to the south. Hawks wheeled over adjacent flats of low, wind-pruned vegetation, while swans floated on the bay.

The road turns up a verdant valley past choppy Lake Forsythe and thence up over a steep ridge to the overlook down into the huge bowl that defines the perimeter of Akaroa Harbor.

If we had followed the shore a little farther, we would have come to Penaki Bay, where in the mid 1800s, a shore whaling station flourished, and beyond that a lava headland called Snufflenose.

The hillsides were clothed in light-green grass, so lush it spilled over the underlying soil like a green river interspersed with blocks of somber dark forest (green pines, planted so densely that they grew straight up, fighting at their crowns for a modicum of sunlight).

We wound down a switchbacky road in the inner caldera until we reached sea water, frosted jade beneath gray clouds.

Fingered Akaroa Harbor is deep enough (I haven't seen a chart) to take fishing boats, 20-40 ft. way up. I saw no larger craft. The occasional farmhouse is Victorian with utilitarian outbuildings. The jagged crater rim is heavy with gorse and from a distance rusty.

The land is well watered. Little streams gather and enter the Harbor at a dozen places.

The communities are small ones, Akaroa on the east slope being the biggest. I guess its population at a 2-3 thousand, swelling to twice that in mid summer tourist season, a couple of months hence. We are at earliest spring now.

The road is narrow and winding and Phyl was tense during it, especially since I admonished her to keep on the pavement, which she has a tendency to leave in her caution, as cars and trucks zip past.

A dozen times we could see Akaroa across the bay, tiered white houses up the slopes, a smattering of moored vessels in the bay, and two piers jutting out. The larger had three fishing vessels muzzled alongside, a swirl of gulls circling over them and standing expectantly on the old dock.

The town is heavily French in influence—Rue this and that. We holed up at a nice motel, the Wai Hi, right on the water, and then made our way down to the dock to catch a ride on the harbor tour aboard the *Canterbury Cat*, a nice 65-ft. catamaran rigged out for tourists, Captain Ron Bingham, skipper.

He gave an informative talk as we cruised along, about French history, the buildings, the old lighthouse, the cliffs, the nesting cormorants, little blue penguins in the bay, up against great lava bluffs and almost into the cavernous maws of the lava where he showed us the birds and an old sheep isolated by a fall into a cavern that she could not leave.

At the bay entrance, the afternoon wind had picked up, producing a little bump, which the big cat rode over easily enough. He said that this time of year the little dolphins were very scared and would come in later as summer approached. We would be lucky to see one, he said, and we didn't.

On the way back he nosed his craft close against the cages of a common salmon mariculture pen. There, a thousand big fish boiled up as the mate threw them trout chow pellets. A tiny tender's house on the hill behind housed two young men who fed the fish and protected the place.

The cages of the fish were of heavy galvanized pipe, more or less octagonal and articulated in the center to respond to the swell by bending. These held some kind of netting and floats. The articulations caused the cages to move easily in the low swell. I'd guess there were 8-10 pens. It's hard to see how the effort could be very lucrative, though I know little of the price of salmon and nothing about markets.

We passed a single big, fat southern fur seal (*Neophoca*??) on the rocks at the entrance to a lava cave and then made our way in.

Tomorrow is a day off waiting for the boat and then Friday I've arranged a morning charter on the cat. The skipper knows Steve Dawson well and likes him.

Bingham is middle-aged, trim, knows his stuff, and handles his ship with professionalism. If there are dolphins nearby we will find them, though I doubt my chances of success. The dolphin has been suffering seriously at entanglement—far more are being killed than can be produced locally. Steve says the problem is bad here and less in other places, but that he'd rather stop a problem before it got out of hand than later when it was critical. I see his information all over town—straight, unemotional, effective stuff.

I was curious about Akaroa history so as Phyl and I poked around town I picked up a good book called French Akaroa that told the story—different than the one in our tourist books. It told of competition for empire between England and France—and the

lucrative whaling trade of the 1830-40s that had moved into the distant Pacific—a two-three-year cruise away, in need of bases, of other commerce, flax, hemp, and more that became a competition with England. France played it clandestinely when one of its subjects signed a very dubious sale with the Maoris for the Banks Peninsula—for a pittance—\$1,000 of gear of one sort or another. The government, after considerable temporizing, backed him with two vessels and the materials for a colony and then a solicitation went out for colonists and about 600[?] people responded.

At the same time, England had moved into North Island and through a somewhat similar treaty, moved in.

This was all after the French Revolution and much of the fight was gone out of France, it seemed, so she did not prevail.

Anyway, we sit at the heart of that thrust, now a century and a half old. It's hard to realize how the world has changed since then. Some things haven't. The plan fell into the commercial competition of nations, an old, less urbanized culture was ground under the heel of the new one and dealt with in a cavalier fashion. One culture replaced another, and just as in the idea evolution in science, it did so by trampling the old idea structure and its people, who were left adrift to adjust or be cast aside in the rush of social evolution.

One reason France was interested in the colonial enterprise was to establish a penal colony on the Chatham Islands where its dross could be sent and made to fend for themselves. Society would thus be purged. But would it? A new culture, as good as the old one rose out of such castoffs in Australia, as good and vital as its parent.

In France's case, poverty in 1830s was rife in the countryside; the poor were at the edge of starvation and glad to leave. A contingent of laborers, craftspeople, carpenters, butchers, farmers, and such left their single-room, dirt-floored houses in France, which they shared with the stock, in hopes of better food than millet and chestnut flour . . . for a better hope, even if they had to build it from scratch.

France used the church. Priests came too, along with Catholicism, which could be pitted against the English Protestantism as a weapon of colonialism. Doctrine against doctrine. Indoctrinate the children in their juvenile time and they would build their lives on its tenets and be the church's forever. If one church was different enough from the other, the purposes of nations could be served by such doctrinal war. We will explain the world whether we can or not and we will build our lives on the resulting constructs.

Well, Phylly and I went off to a local hotel, the Madeira Hotel and Bistro, and we had a grand fish meal and some local wine—a little thin, I thought, and a Madeira ice cream dessert and thence to our warm room. A bit brisk here these spring days.

October 4, 1991

New Zealand, South Island, Akaroa

Today Phyl and I wandered Akaroa, soaking up the ambiance of this quaint historic place, visiting a *Protea* nursery (we obtained an autographed book by the author of *The Proteaceae—New Zealand*, Lewis Matthews, photography). Then we dropped by the pub for a little garlic bread and soup.

We checked out the museum, which chronicled the English-French struggle, the whaling, the incorporation into British empire, the plight of the Maori, who were cast aside in these imperatives.

It was a blustery day so we pulled our coats tight and drove along through this quaint, lovely place.

The museum had a slide show that among much else said that Langlois, the person who started the colony here, was influenced more by beauty than practicality. There is very little flat land to cultivate, but an elegant harbor.

So we sit here in the afternoon after the drive, catching up on notes and clustering around the wall heater. If all goes well I go out to sea at dawn.

[Drawing of area]

October 5, 1991

New Zealand, Canterbury, New Brighton Beach

All didn't go well and I didn't go out on the *Canterbury Cat*. As we were walking to dinner at the Chez La Rue down by the harbor, Captain Ron Bingham of the *Cat* drove up and told me that the weather was predicted to turn bad and we shouldn't go out. He was certainly right, as it proved. So instead of staying in Akaroa, we packed up and said our goodbyes to Marie, the young girl who had cared for us in the motel, plying us with literature, towels, and other bits of help.

With Phylly at the helm, we headed across Banks Peninsula to Lyttleton and ultimately Christchurch. The road took us back over the ancient crater lip, now a bowl of sheep farms, down to the village of Little River, once again just the vestige of a town, a store, houses, some old Victorians on sheep-dotted pastures. Old trees lined the road, including the ubiquitous Lombardy poplar. Then we wound along the shore of Forsythe Lake, which ends at Lake Ellesmere, which seems to be a huge brackish estuary bounded on the sea side by a long barrier dune. I think it's partly fresh as sedges formed clumps along its edge. But the real interest for me was that it was dotted with hundreds and hundreds of medium-sized, gray-black swans, both on the sedge land and in the water, tipping up or just floating. We saw one momma swan followed by a tiny signet as if she was towing a toy boat in her bath. The road then took us inland at Motukarara, up the Gebbies Pass Road and over the crest. Some modest patches of native forest and scrub remain, flax patches in the gullies and short trees up on the hills.

Soon the road edged around a corner and we looked down on magnificent Lyttleton Harbor with "Back of the Bay" and Quail Island in the foreground and the shipping port of Lyttleton across the bay in the background. A container ship edged in with a heavy deck load of red-painted containers, to a dock with long cranes to take them off and stack them on the spacious dock behind.

We headed out on the east side toward the residential community of Diamond Harbor and there found a park where we could walk down close to the water. The bay is milky jade, surely with glacial flour from the two big rivers that drain the high mountains that form the spine of South Island, and that one can see, cloaked in white almost down to the level of the Canterbury Plain. These rivers are the Rakaia River to the south of Canterbury and the Waimakariri River to the north. The result is a plume of reasonably opaque water in both the Canterbury Bight to the south and the Pegasus Bay to the north of the Banks Peninsula and enveloping the entire Banks Peninsula. It is in this murky

water that Hector's dolphin lives, and where its curious, high-frequency 1120-1130 mHz, narrow-band pulses find their utility.

Both Steve and I feel that this is a facultative convergence with the very similar sounds of the Phocoenids. My guess is that dolphin sounds are labile and that they are pushed up to high-frequency registers in murky water and that Phocoenids may have fixed such sounds there but perhaps these delphinids might not be fixed. The structure of the Phocoenid forehead may have changed to make only these sounds. This may not be the case with *Cephalorhynchus*, whose skull is very delphinid.

At any rate, I scanned the bay at some length and may, just may have seen Hector's dolphins amidst some feeding terns far across Lyttleton Harbor and out from the towns. I rather suspect I didn't though.

We went as far out on the east shore as we could go, to Purau and a little beyond on a dirt road where we were finally admonished not to go farther (by a sign) that announced it was lambing time. Purau is a lovely little calm nook dotted with small sailing craft at mooring.

From the back of Purau we took a winding, narrow, two-lane road to Pt. Levy, the next cove to the south, a long, narrow bay between the fingers of the crater and probably a Maori village in that it had a meeting house, a little pier, and a cluster of houses. At the back of the bay was a big, old, two-story house, gabled and elegant with green fields and a herd of red deer, and allees of big trees.

We looked and looked but no dolphins and then Phyl picked her way nervously back toward Lyttleton. We had lunch, drove through the teeming port, and finally over the hill to New Brighton, the beach community of Canterbury, finally finding a motel and holing up just as the wind and rain hit.

It whipped around our snug room as we tried to warm up by the little electric heater and then made for a local disco for a meal just as Phearless Phreddy was warming up and testing his light show for the onslaught at 8:00 PM. We left at 7:59.

The Future of Wildlife on the California Desert: Management Options and Dilemmas

There is a constant running battle on the deserts between those who would manage for orderly human use and growth and those who would preserve ancient prehuman patterns and life.

1. Often enough, though by no means always, the real cause of the struggle is neither stated nor understood by either party.
2. As I see it, the struggle boils down to this:

The wildlife and the patterns of diversity they take on the deserts is the result of the history of the earth and its evolution.

The origins and life patterns of the lizards that patrol the rocks in front of this cabin, of the cacomistle that climbs these rocks, of the Mojave yucca down on the gravel apron below is connected directly to the history of everything that makes up the desert.

It is intricate, intermeshed, and interdependent, far beyond the little we now know. Most, maybe 90% of how desert things survive, where they came from, and what they do, and even who they are is still unknown.

These patterns and most of the life involved cannot stand human intervention. We know far, far too little to in any real sense manage human impacts upon the totality of desert wildlife.

For many human and many wildlife patterns there seems no real middle ground possible.

The last desert wolf was seen in the early 1920s on the flats to the east of this cabin, part of a regular, long-gone influx from the mountains of Mexico. In these yuccas, not too long ago, wandered the 5-ft.-high ground sloth of long, red hair.

For many we can guess how to preserve samples that may survive, but always we guess. The more we intervene the more we guess, and the more we can be sure we will lose. The life patterns of the individual animals are too complex, and their age-old interactions and interdependencies, totally unknown for us to do more than suggest a plan, and if we haven't planned right, back off when we prove wrong.

If we want to preserve this record of past life, all we can do is to provide lands and waters of sufficient size, habitat diversity, and artful placement that the animals and plants that make up this ancient life can make a living surrounded by the other mostly unknown interactants of their lives.

So we must guess and tinker very lightly, learn to back away when we prove wrong.

One other thing. For the most part, these guesses are for ever, at least for as long as we value this past history of life and attempt to save it as a history of our world. Ours is the last chance.

This, as I see it, is why politicians, planners, and environmentalists are so often at odds.

Politicians and planners live by artful compromise with shaping of a reasonable and acceptable process of change as a goal. Their goals are almost always homocentric.

Conservationists know in their souls that it will not work, to manage, the wise amongst them know is simply to save the land, to cover the gross patterns of life as they understand them.

Many conservationists feel and their perception is correct that what has been saved cannot persist in the face of multiple use management, because above all, continuity of the land and the patterns of life it provides is the final arbiter of survival. Reasonable men and women cannot jigger in their vast, pervasive ignorance with the very source of life itself, the land.

So how, in my view, is BLM doing? How is the Forest Service doing? How is the Park Service doing?

Marginally in all cases, I think, and not at all because these organizations do not have people of enormous goodwill and skill involved. I, for one, look on our desert

district with something akin to awe at the depth of commitment, the steady hands at the helm, and the collective skills.

The success in protecting wildlife and ancient patterns and processes is directly related to how much land is left alone in relation to how much is exposed to the . . .

Natural Values

It is possible to envision a desert future in which the essential scenic and natural values of the existing desert are preserved into the indefinite future, and in which much of the diversity of use remains possible. This differs from other schemes of land management in which land is devoted largely to a single value to the exclusion of others, as for example in a park.

But this cannot be done without modification of the way in which the mandate laid down with the establishment of the CDCA is presently carried out. Specifically, the natural values of the desert are the modern endpoints of processes as old as the desert itself and once gone they cannot be reconstituted, so a commitment to manage them is a permanent one. Also, if BLM wishes to make a permanent commitment to these values, a plan should be put in place as soon as various changes are underway, especially in western deserts that are limiting options with considerable rapidity.

The opportunity for BLM is a groundbreaking one. Instead of establishing a preserve in which the diversity of public use is narrowly controlled (scenic, narrow recreation areas, as in National Parks), a more generous goal can be sought that includes the values listed above and also accommodates a broader range of recreation, education, research, carefully controlled mineral extraction, and some level of range use. The key criterion is that the integrity of the basic habitat and its life should govern the management of such lands.

What form across the desert would such a plan take?

The BLM must develop as a basic order of business an ongoing quantitative database that describes the changes occurring on the desert from the many important standpoints. These should include such items as population patterns, transportation, utility use, mineral extraction patterns, grazing use, military use, and agriculture.

Evaluate the state of CDCA in order to secure protection for the wildlife of each of the three major physiographic divisions of the California desert. Such protection absolutely requires that the ecosystem of which the wildlife forms are members be protected as a primary order of business.

This does not mean that other uses of such protected lands cannot go on. It means that the health of the desert biota is primary and that such other uses need to be managed with the health of the biota as primary.

It needs to be remembered that once the ecosystem is destroyed it cannot with any present management method be reconstituted. Such ecosystems are simply too complex and too completely the product of millions of years of history, for such management to work.

It seems likely that true ecosystem protection of this sort can mostly be achieved on the eastern sections of the Mojave, Great Basin, and Sonoran deserts, while lands closer to urban centers have already impacted the land sufficiently that such major protection will be less than perfect. Even so, wherever important wildlife elements exist,

in heavily impacted areas, attempts to protect these elements, if not the entire system to which they belong, should go forward to protect as well as possible the wildlife as it presently exists.

The range of compatible uses can possibly include recreation, carefully controlled grazing, utility corridors, mineral extraction, and other elements.

This will amount to permanent zoning. If such permanency cannot be assured, then the very probable result will be that the BLM cannot provide permanent stewardship for wildlife.

November 5, 1991

California, Contra Costa County, UC Berkeley Campus, Men's Faculty Club

Tonight our dear colleague these many years, Roger Samuelsen, retires. Most of the rest of us who fought the battles and shaped the form and fate of the University of California's Natural Reserve System are already retired and watching now, from the sidelines, as this creation of ours takes its own course beyond us and our time.

That, of course, is good. No such creation is worth much if it dies with its creators. Me, Mildred, Brother Bob, Dan, Bill Mayhew, Bob, who lined up all those budget projections for us to puzzle over, Sarah and so many more have ended their skeins, and now Roger, too, takes his place with us.

I feel fulfilled and good. We have together used our very different and sometimes contrasting talents in remarkable unanimity of purpose, to do a job that could be the most important thing any one of us could do—to provide a living baseline against which to measure and understand the flood of change which now envelops our world and all in it. NRS, under our diverse hands, has already become a place where the best young minds and spirits can learn the real shape of the larger world. It promises so much more, not just for a single campus, the University, or the state of California, but for the larger world, without such artificial boundaries.

It is already a place to ponder in and to teach these things without peer or parallel.

This has been Roger's professional life these last decades. It could not have happened without him and it bears the stamp of his deep professionalism in a thousand places.

The vision formed in the crucible of change at UCLA, where the megalopolis was swallowing up our human contact with nature. It became, in time, an enormously complex venture beyond, I think, the scope of any of us alone to develop.

Roger's special genius and crucial talent was, I think, that he brought us together for the task, however much any of us might, individually, press our own viewpoints. He kept us pointing forward, all of us, and in deep comradeship and commitment. The mission we were on was never obscure, nor was the commitment and integrity of any of us a question.

Roger shaped that. He cared for us all and for the hundreds of diverse people who, for hundreds of reasons, touched our affairs.

The faltering old woman who loved her little cluster of oaks and the tiny rills that ran under them in springtime, but who could understand neither the larger imperatives of NRS, nor the faceless and huge University, was as carefully cared for as the young woman who thanked us all for helping her study her precious ants, or the reserve manager who saw the lack of a truck as central to all wrong things on his reserve.

Roger never would, never did, do, or allow to be done, a piece of work halfway, and if it meant waiting, the wait was a secondary problem and the integrity of what he did primary.

That, not infrequently, drove various of his friends up a tree, and sometimes brought about floods of postcards, one a day, each bearing the simple imperative: "Onward Roger."

Never mind that his task was staggeringly complex and became huge as the list of reserves burgeoned to close to 30, and the impending legal, land, and fiscal decisions stretched out as long as your arm.

But Roger built well and as solidly as any one ever could. A recent high-level review recognized our work for what it is—a monumental resource like none in any university here or abroad.

So, it is a good time to stand back. It is a grand time to feel proud of what we, and most of all you, have done.

It's a time to feel the warmth of all of us around you who love you for the humanity with which these working years have been spent.

Now, Rog, let me tell you about retirement and the things I have planned for you. I've already addressed the postcards.

April 9, 1992
Granite Mountains

The Global Field Theory of Sand Dune Song K.S. Norris, E. C. Evans III, Flip Nicklin

A variety of observations together come very close to explaining why some sand dunes "sing." Put simply, the "song" results from the activating-force of dry sand cascading or slumping down the slip face of some dunes, setting the surface layer of sand into an oscillation that is especially strong at the toe of a sliding stream of sand, but which is also produced more widely in the slipping cascade, perhaps on its bottom surface where it contacts the still often moist sand beneath.

The moving sand oscillates between a dense packing state and a loose state, and this oscillation can often be seen as a wave on the surface whose crests are separated by a measurable distance, 12-18 mm (a stamped foot).

The maximum amplitude of sound was 2-3 ft. ahead of a moving person or disturbance. The supposition is that the slumping or sliding sand provides the force, the sand stream is set into oscillation and a sound emanates from the dune.

Now, why should some sands sing and others not? Kelso sand is only modestly clean, being rather heavily contaminated with aeolian material including magnetite from

the adjacent Granite Mts. and perhaps other sources. Its grains are also relatively rough compared to say, the Imperial Sand Dunes, which do not sing. The implication is that the grains are “doped” as if one put rosin on a bow, so that they cause the grains to excite each other to motion as they move past one another.

The oscillation, we propose, results from the grains shifting back and forth between the two packing states as restrained by the weight of the overlying sand and the packed or moist sand beneath, and by the consequent oscillation of interstitial air pressure that results, smoothing the shift in pressure to a clean oscillation.

The weight of the overburden of sand may well cause the interstitial air pressure to override that produced by the simple change of packing state alone, thus promoting the clean oscillation of the grain pore spaces.

We clearly observed that a wide range of frequencies of sound could be produced from this single dune. The primary source of such change in frequency seems due to the velocity difference of grains against one another. A stick thrust in sand produced a squeak, a slower moving hand sliced against a dune a lower bark, and slicing[?] sand lower sounds still, until just above the point at which movement of slipping sand ceased, the sound could be very deep indeed, perhaps below our ability to hear.

When watching a sliding tongue of sand, it could be seen to ripple, the wavelength matching the frequency ranges 200-250, perhaps to infrasound. 30-40 Hz? Dominant near 90 Hz and the fifth above is 126 Hz.

This effect could also be produced by kicking a boot against the slipface, with the sand rippling to the lower side of the boot.

When a tongue of sand slides down a slip face, this wrinkling can be observed at the lower half, about, of the tongue. As it comes to a stop, one often observed a more rapid upward moving wave, as the downward sand stream came to a halt. I assume this wave to represent the last downward movement of sand in the absence of a new sand supply, moving into the loose packing state.

Perhaps the oscillation of the sand “heterodynes” the sounds of the grains rubbing against one another, producing a subharmonic note of purity and strength. That is, the sound of grains moving against one another is “played against” the oscillation of interstitial air which imposes its note upon the other vibration.

“The pursuit of science is the nexus of points of failure peppered about a single point of success.”—Evan C. Evans III

“I can do it. You can do it. You can tell me how to do it. But you can’t expect me to do it how you wish I’d do it.”—Flip Nicklin. Great statement on human relations.

“Measure it with calipers. Mark it with a grease pencil. Cut it with an axe.” —Comment on Corps of Engineers from ECE III

“The only thing worse than being wrong is being right and having nobody listen.”—Flip Nicklin

Evan says earthworms are possibly considered as snakes according to California Law.

“Is there an overabundant species act?”—Flip Nicklin

“All law is teleological, based on intent.”—ECE III

“The three blind men and the elephant. The first stuck his hand up the asshole and reported a hot spring, the reports of the other two were unfortunately lost in the ensuing environmental readjustment.”—ECE III

“You can lead a horse to water, but you can’t teach him the backstroke.”

Protecting Wildlife Values of the California Desert Into the Indefinite Future

The major impetus for the proposal of alternate laws for the management of the Californina desert is the perception that the present management regime for the CDCA will be unable to protect the integrity of the wild lands, plants, and animals of the desert into the inndefinite future.

The reasons for this perception seem simple:

1) The BLM process is the most open among federal land-management agencies, allowing for continual review of its procedures and conclusions by the user public. The ancient natural patterns on the land are the result of millions of years of evolution and cannot be reassembled once gone. This includes such things as migration patterns, ecosystem structures, seasonal emergence patterns, and species composition.”

Thus the open BLM process is a constant threat to natural values. The means of designating and providing long-lasting protection for a carefully selected sample of these values is therefore critical.

2) The usual solution to such longterm provisions for the wild values of the desert is almost always conceived as being to lock them up away from the meddling hands of man. Such a solution typically removes the chance for a multiplicity of user classes that BLM specifically supports. There is almost certainly considerable room for melding many of these uses with management and [?].

For example, power transmission and generation, recreation, mining, and livestock activity can in many cases be carried on alongside cocnservation of the biota with the proper planning, and in a climate of conciliation. The new science of conservation biology is beginning to show the way for such artful compromises to be developed.

3) But foremost in the minds of those who would plan for such a future, must be the preservation and perpetuation of the ecosystems of which the desert is composed. There is, I repeat, only one chance for them.

To lose them is not trivial. Contained in such systems are all the compromises and balances that have resulted from history and there are a great many things to gain and learn from them that we must not lose. The only sensible alternate to such artful planning is to lock up large parts of the desert without such thought. . . .

By Saving Patterns on the Land—
You save both what you know and what you don't know

What are the patterns?

- 1) Protect migratory paths.
 - a) Stopovers for birds.
 - b) Bighorns to butterflies
- 2) Protect samples of the three great physiographic divisions.
 - a) Colorado-Sonora
 - b) Mojave
 - c) Great Basin
- 3) Protect water sources and life.
 - a) Amargosa
 - b) Springs
 - c) Mojave River
 - d) Colorado
- 4) Protect marks of the past.
 - a) Ice advances
 - b) Interglacial
 - c) East-West
- 5) High-Low
- 6) Protect specialties.
 - a) Calcophytes
 - b) Lake beds
 - c) Burros[?] Deer
 - d) Salamanders and frogs
 - e) Maturango tohee
 - f) fish populations
 - g) falcons, mountain lions, cacomistles, lizards, snakes, insect faunas, etc.

Most has been protected to a degree, but not recognized in a desert-wide plan.

Problem of continuity. A matrix in conservatorship with private sector conservancy.

One third of the nation's land is managed by the government. This means it belongs to all of us, and we should say how it is used and how it is managed.

Who are we? We are 23 senior environmental studies students from UCSC about to launch into careers dealing in various ways with the fate of the land. What, then, do we public landowners want? We will list:

1) No public land that is being preserved or used primarily for its natural values should be subjected to any use that degrades those values.

To give examples, no national forest lands whose values have been decided to be timber should be cut in such a way or at such a rate that the basic forest resource degrades.

Cutting that degrades the soil or that occurs faster than the trees can replace themselves should not be allowed, but instead new means of forestry sought that do not cause such unreplaced[?] disruption. No immediate economic benefit should be allowed to disrupt this policy. We must not "mine" these values, but must recognize that they are finite.

Another example can be found in our parks. The natural land and its biota are a park's basic value. Such parkland as is preserved for its natural values must be protected from degradation, both from within the park and from outside its boundaries.

This does not say that certain amenities that are locally disruptive of a park's natural resource should be [?]. It says instead that parks should be zoned and such amenities placed outside park boundaries whenever possible, and when inside it should be clearly understood that part of the park is being sacrificed at its most basic level to such needs.

2) It is a myth that public lands can better be managed by the private than the public sector.

Land management, at its very core, requires applications of a philosophy that is selfless, and that puts the public trust ahead of private gain. What is needed is a protective presence that is free from the daily tug and haul of the economic pressures that guide the private entrepreneur. At many points it will be crucial to be able to put the fate of the land ahead of private gain. That cannot be achieved in private hands in a capitalistic system.

3) Where economic considerations and the integrity of the public land collide, let the land win.

This will drive the extractive disciplines to seek new techniques. That will perpetuate the value of the land for future generations and not allow them to degrade it for short-term benefit. This is not simply visionary, it provides for the long-term stability of our country.

Manifesto for All Public Lands

A balance should be struck between lands devoted to agroforestry (where the complex ecology is suppressed in favor of monoculture) and ecoforestry (where the

dynamics of the forest ecology is made an integral part of forest exploration.) Normally steep and remote mountain lands will require ecoforestry.

Forest lands are required to be managed for multiple uses, which include wildlife values as well as production of forest products and hence the life patterns of wildlife such as migration and home ranges must be considered as basic to forest use.

A [?] of statutes and rules governing federal land management should be made with the aim of removing incentives and disincentives that force management practices to be driven by motives other than care for the living natural resources in perpetuity. Example: subsidies for road construction and mining.

Mineral Extraction—best left unexploited until need is strong, then used to stimulate national economy. We must face finiteness of land and its resources and therefore priorities should be on restraint.

The provisions of NEPA are being widely violated on Federal Lands. This should be revised.

April 5, 1992

New York

Burroughs Award

[Take 1]

During my years as a working scientist I did not imagine that I could one day write interestingly enough to join the distinguished company of other Burroughs awardees.

It was enough to hope that being a scientist hadn't wrung all the poetry and sense of beauty from my soul. When, from time to time a journal editor would object because my scientific prose was too simple and unadorned, I didn't know whether I was failing or winning.

A year and a half ago, at the age of 68, I graduated for the 6th or 7th time in my career to full-time emeritushood. The restraints of science were behind me. Yowie!!

Now, I said to myself, I can tell my stories with whatever sense of beauty, pathos, humor, pain, exaltation, hope, fear, and love that I have felt all along. I tried to leap and click my heels, but sadly I reached only 6 in. above the ground. . . .

[Take 2]

During my years as a working scientist I did not imagine that I could one day write interestingly enough to join the distinguished company of the other Burroughs awardees.

It was enough to unsnarl the obscurantism of science and now and then to be accused of writing too simply.

Yet here I am, and of all the credits I have received, this is the most exciting to me.

I am now a 68-year-old naturalist who has experienced many things all over the earth, and more than anything else I want to tell these stories, to sum up my naturalist's view of things.

You probably know me only as a dolphin specialist, but my intellectual wanderings have taken me much more widely than that, as first a chemist (a brief and desperate venture, at best); then a geomorphologist of deserts (wonderful fun, a time of camps and hikes all over the west); then a student of desert animals (even better fun), and my introduction to evolutionary processes and their histories and adaptations. Then an ichthyologist (my PhD was an exciting study of the life of a nearshore fish). . . .

[Take 3]

As a working scientist I never imagined that I could one day write interestingly or well enough to join in the distinguished company of your other awardees.

Yet here I am, and of all the credits I have received in my lifetime, this is the most exciting to me because it is so unexpected, and says that if I work hard enough I have a chance of doing better still.

At the age of 68, that is a very exciting and intriguing vista, coming as it does at a time when the rigidities of science number the days I wish to spend with that cumbersome process.

I fit your template because I have felt throughout my career that science should not be the precinct for a few, but its discoveries about how the world works should be made accessible to everyone who is interested, and should thereby become an integral part of our social process.

After all, we scientists, as I know very well from my own experience, are not some special breed. We are just people. We cannot with honesty set ourselves up as priests and then cloak our work in a hidden code designed to exclude those who have taken other paths.

It is in fact common among those I travel with to bay at the moon, to cuss, to dance to mariachi music, to orbit in the magnetism of women—or women in the orbits of men—or to resonate to the beauty of a hidden pool up some untrodden fold of the mountain, up where a yellow brushstroke shows where mimulus grows, against the green of horsetail rushes.

It seems to me that poetry and science often have the same roots. Whether each may start by observing with as clear eyes as can be achieved, asking nature questions, asking again, clarifying until something comes clean and true. In such a way each, the poet and the scientist, attempts to be a truthsayer. In my remaining years I want to explore this nexus, here so inadequately outlined. What I will write will likely be part of both, but I do not intend that it should be science and I cannot aspire to poetry. I can, at this stage, be a storyteller.

My book *Dolphin Days*, which you have honored, is I suppose familiar to most of you. So, it has been suggested that I talk mostly about other things, especially my plans for new works of natural history, if I have this in my future.

Let me say that the spinner dolphin work goes on today. My boat is at sea off the Kona Coast of the island of Hawaii and students continue to learn about the remarkable lives of spinner dolphins, animals who live in the almost totally foreign, open sea and whose minds in some ways rival our own. The question is how do they, living totally in 3D open water, do so with such capability?

One new thing we have found is that these animals seem to regulate everything they do by rhythms or oscillations, more completely than any other animals I know.

(Explain rhythms, zig-zag, social concourse bouts.)

Does this pervasive use of rhythmic patterning perhaps relate to the occurrence of rhythmic behavior in other animals, including us?

Let me take you back for a few moments to my own history and then to the stories of dolphins, which brought me here, and then finally to sketch briefly my next project.

In my career as a naturalist, I personally have refused to be spindled and filed as this or that sort of observer of nature, even though how I am known to the larger public may have done that.

I have always, I think, wanted to take it whole.

As a boy under my father's wing, I started as a hunter and fisherman, where that is what you do, take it whole. Then I became fascinated with the elemental building blocks of nature and aspired to be a chemist, but I needed to be outdoors. So I spent some years as a geologist, a geomorphologist fascinated especially with the majesty, beauty, and life of dunes, but once again, with the earth as a whole, beneath it all.

Then I fell under the spell—there is no other word for it—of the old South African naturalist, Ray Cowles.

. . .

[Take 4]

In these few minutes we have together let me tell you where my views of this world came from, then catch you up very briefly on the spinner dolphins of Hawaii, which I am told many of you will have sampled through my book *Dolphin Days*, and finally tell you what is next.

In my career as a naturalist I have refused to be spindled and filed as to what sort of scientist I was supposed to be, beyond assuming the self-anointing of "Professor of Natural History"—one of two in the UC system.

As a boy under my father's wing, I started as a hunter and fisherman. In some ways that start was irreplaceable. One took the world whole, one pitted wits against the quarry. Where were they? What did they sense of you? How did they use their world? There was so much there that most scientists never see. But the game became too unequal. It became a chase.

The discoveries and power of science fascinated me when I grew old enough to understand its process. Piece by piece I have blocked in the larger world. I became fascinated with chemistry . . . with the search for elements, the building blocks of nature. But it was indoors with the world "out there" somewhere.

Then I spent some wonderful years as a geologist—a geomorphologist, attracted to the majesty and beauty of landforms, especially dunes, their mathematical loveliness and perfection, and with the larger earth over which they moved.

To many of my geologist colleagues of that time, the life of the land was a thing to be ignored, the fields of flowers spread on the springtime desert and the nesting birds were hardly seen.

Quite naturally, I think, I fell under the spell—there is no other word for it—of a remarkable South African naturalist, Ray Cowles. He would introduce me to the worlds of birds, reptiles, and the beginnings of ecology.

I went from there to complete a doctorate on fishes and do much field work in Mexico under Carl Hubbs at Scripps Institution and from there, because of my interests in public education, to the second oceanarium in the world, at Los Angeles, where I became curator.

There I caught the first whale to be brought into captivity and began to learn about those remarkable mammals, the dolphins, with whom I have spent much of the next 30 years. I have been part of learning how they swim, echolocate, form societies, and what their culture may consist of.

Now I have come to the time when I want to put these [?] together, . . . to look beyond the various viewpoints—and that is what my book-in-formation is all about—*Mountain Time* it is called.

The scientist-naturalist tries first and foremost to perceive how the natural world works. How very important it is for us humans so typically wrapped in delusions of our own making to know these things! In the workings of the wild world lie the keys to understanding our own.

In our cities we are buffered in all sorts of ways, buffered from the torrential rush of water following a storm, the bite of the cold wind, the searing heat of summertime on a desert rock face. We are shielded from predators lurking just beyond our shield, whatever it may [?], and we are provided with food and shelter as if they were given rights.

None of that is true in nature. What's it like out there? What are the rules, really? What can they tell us about where we are steering our society from within the glass-walled, carpeted, heated chambers where we make our decisions about the future? What right have I to talk about these things? I don't think I'm smarter than most of the decisionmakers, but I am, routinely, closer to the real world. So maybe I have something important to say. We'll see.

[Take 5 is too messy to transcribe]

May 29, 1991

Sweden, Kolmardens Djurpark

At Amsterdam my bag is lost and there proves not to be time to retrieve it. I run back and forth down a long, echoey hallway between security and the Aussie girl at the TWA desk as the time to board ticks closer. Gimlet-eyed security guards suspect me at every turn, making sure we never set our bags down where a terrorist could slip in a bomb. I'm pleased to cooperate. But my bag never appears, and I finally run for the plane and board for the flight to Arlanda Airport at Stockholm. There I file a missing-bag report with a pretty, efficient stewardess and head for the entrance, where Mats is waiting. He is far from calm about the coming dissertation exam, but our conversation runs smoothly in an old friendly way as we arrow south to his zoo at Kolmardens at Nordkoping we stop to shop for some interim clothing for me for the exam, since I had arrived in an open shirt and with no luggage to improve things. I finally select a summer coat, some socks and shorts, and a sexy necktie covered with butterfly scales.

Off we go to the zoo, a few miles south. Mats and his family live in a little house a short distance from the zoo parking lot. Wife Birgid, sturdy, has her own space, loving, two sons, Jonas, into cars and Eskil, an animal prson. Both in their teens. We have a snack and deposit me at the nearby hotel overlooking a sea channel back of the Baltic, small freighters and tankers ply by, sea birds, including a big raft of swans, dot the surface and call from the air. The hotel is on a cliff amidst the elms, oaks, and pines. Very beautiful. I immediately crash and don't wake up till 3:30 AM to the northern dawn light. After a while I drift back to sleep and arise at 5:30 to accompany Mats north to the University of Stockholm where his exam is scheduled.

May 30, 1991

Kolmardens, Sweden

We knife up the open roads to Kolmarden (1½ hrs. S. of Stockholm) through copses of forest and fields, some of rape and others fallow or green with new green.

Mats had had his PhD work printed up in a volume of seven papers, centered around the issue of odontocete cetacean phonation. It is an elegant little volume with many color plates in the back and one on the cover, all of phonation anatomy. I had reviewed each including a long introductory piece that summarized his overall views.

The University of Stockholm sits in an old farmstead and is composed about half of some of the ugliest modern buildings I have ever seen. Functional architecture at its worst. Mats agreed with me. It was hard to tell it was a university or a methyl cellulose extract factory. Tinny and cheap looking from a bad choice of materials. Airy inside and perhaps functional but filled with pipes and blanketed vents and exhaust lines without imaginative painting.

The exam was public. I was the outside examiner and main controler of the flow of the exam.

I met with the committee in the chairman's office: Dick Nassel, a young neurophysiologist, a fish endocrinologist, a behaviorist (Scholander—no relative of Per), a gaunt ethologist population man from U. Gobeurg to the south, and I.

The rules were laid down and off we went to the hall, the biggest amphitheatre in the University. I guess 100 people attended including Henry Truby.

I first introduced the field since attendees were public and people from other fields, and that went on for 15 minutes. Then I summarized the importance and contribution of each paper and then led into a series of questions to Mats. The chairman Nassel then opened it to the public for a good general discussion.

Mats was composed and increasingly relaxed as the exam went on, fielding questions openly and directly. The best discussion came when we got onto the mechanism of sound production and whether or not simple impact could produce the intense clicks dolphins make.

Then, two hours later, it was over, the committee met in solemn conclave. Clearly he was one of the better students in recent years, and signed the crucial paper. We found him in the hall, shook his hand, and called him "Dockter." (One committee member dissembled, noting that one requirement, some classes and readings remained. Mats objects and will fight it.) Then a long lunch, mostly spent waiting for the waitress, and then Mats hauled me over to a building where I gave a lecture on spinner dolphins in a stifling room, and thence to Kolmardens where we had dinner with Mats's parents. Father

is a gracious, gaunt electrical engineer and Mom a small, smiley woman. All speak English and well. I suspect the English on TV does much of this as they use unaccented English for the most part and haven't traveled extensively beyond Sweden.

They took me to the hotel where I was pleased to collapse after a short hike to the water's edge to watch swans feed. Long necks are to reach the bottom.

It was quite an experience. The system is good if the details and nuances of a person's research are what one wishes to use to determine passage to the PhD. The method brings out little about the broader aspects of biology. It was a very much more professional exam than the ones I've been used to at UCSC.

We had a long lunch at a kind of faculty club and then my seminar in a very hot seminar room. It went OK.

Then Mats and I fled Stockholm down the almost vacant freeway at 120 km. Mats was drained, as was I, and anxious to get home.

May 31, 1991

Sweden, Kolmarden

Bertel Mohl and Saren Anderson with respective wives Lotte and Charlotte arrived and were greeted warmly. Such wonderful colleagues! Bertel wanted me to join them in Greenland (at Thule, way up on top at 77 deg. N latitude) for studies of the narwhal, not this next summer, but the summer after. He is trying to obtain underwater videos of their feeding. How do they do it with the tusk in the way?

Lotte and Charlotte, two favorite women if one needs to class people, were full of life.

Lotte weaves mostly. She says with her children grown, baking is cut back severely. Charlotte is still a journalist, writing local news at the coastal town of Strib, Denmark. Both Soren and Bertel seem fine. Bertel retires in five years and Soren struggles for money at his Odense zoo.

We walked various parts of Kolmardens, which has an elegant, open parkland full of antelopes—black bucks, impalas, and others, a fine chimp island, and a great deal more. A great troop of tigers stalked around their moated compound. It's set in hilly terrain in forest land. Quite lovely and the animals seem very well cared for.

In the evening a fine dinner for about 100, much prepared by Mrs. Amundin Birgitte—appetizers, much liquor, roast beef, cheeses, vegetables, a fancy dessert of whipped cream, and thin sheets of chocolate, all interspersed with speeches about Mats. What emerged was how monastic Mats has been to do his work, prepare the book, mostly without direction, and originally, actively in the face of opposition from his zoo director. A new direction was supportive. I told about my troubles at being a stern, serious “opponent” when we knew each other so well.

Finally, at about 1:30 AM, I found my way to the hotel. Tomorrow at about 7:00 AM I leave for the airport and Texas.

June 1, 1991

Enroute, Houston, Texas

While I think about it, Bernd, in his usual incisive way, explained cavitation to me—what I think to be the key to understanding how dolphins make sound. It is in two parts—one is the effect which causes extremely high temperatures in cavitation bubbles

and the other is the noise. The heat can reach the surface of the sun, I recall, and noises are similarly intense. The heat comes as pressure is suddenly relieved and is the same effect as lowering the boiling point of water with increased altitude. At high altitude the change in state occurs at lower and lower temperatures as pressure reduces. There is more molecular space at high altitude, so going from liquid to gas phase releases less heat. the molecules collide less often. The deeper you go the more molecular per unit volume in a gas, so the higher the temperature (more collisions per unit time) occur. So the temperature rises. The other separate effect results from pulling apart the matrix of a fluid and its resultant collapse and oscillation. This makes loud noise. So the higher the ambient pressure, the higher the temperature upon release, while the collapse oscillation resultant upon pulling apart the matrix ought to be approximately the same at any depth, as I now conceive it. At any depth is it the relative or absolute pressure differential that produces the phenomenon? I think it is the latter. Thus, when you lower a glass ball to a 1,000 ft. and implode it with a steel stylus, the sea collapses over it, a 30-atmosphere pressure difference results and a great noise results as the bubble oscillates wildly.

If the pressure differential is less, say 1-1.5 atm., a loud but much lesser noise results, pulling against the molecular matrix of the water and at about that point pulling it apart in cavitation. Why then, if I have all this right are submarines silent at depth since their propellers don't seem to cavitate. I think it is because the fractional pressure change of an atmosphere changes with depth. That is a rapid 1 at m [?] change at the surface may pull a fluid or gas apart, creating a vacuum but the same change becomes less and less a percentage of total pressure with depth, so it is harder to create true cavitation, so heat is not usually released, but the oscillation of pressure around ambient, at whatever depth still creates a loud, oscillating source. It's the amplitude of the oscillation that counts, not whether it crosses zero. If I am right the abruptness and amplitude of a shift is crucial, not whether it cavitates.

So, it should be the loading on the source and its elastic rebound that counts to make a loud sonic using an airstream differential. How much pressure is available on the passing airstream? How big an oscillation is the question and that is not dependent on depth.

So if 1-1.5 atm pressure can be exerted low in the superior nasal passages and if it can push against a controlled blockage point with elasticity (rebound), so that as pressure is released it will build up again, be released again, etc. Now, if this is done by breaking an airstream into packets or bubbles it can be made to pulse. Now if the initiation of a bubble is separated from the next bubble by a different time to the next bubble it can be made to produce different repetition rates.

Perhaps this is why the museau is wedge shaped—high rep rates at the narrow end, low rep rates at wide end, and both related to the velocity of air stream (pressure differential) over the museau.

So by muscular means, an air pressure is built up behind the museau and the airstream directed at specific point at the back of the museau. The airstream pressure forces the lips apart at that point allowing a little air to pass, which uses up a little of the source air reducing pressure and allowing it momentarily to close—thus breaking up the airstream into pulses. these are released just beyond the lip margin into a tissue-enclosed space that is both vented to take air away and restricted so that the oscillating gas bubble will drive a compliant portion of the tissue wall—the wall of the dorsal bursa—which

transduces sound into the fat and thence out the melon. This produces the tissue [?] click. the vented oscillating gas produces the low-frequency position of the signal a very short time after the HF signal is propagated.

Now what does that space beyond the lips look like? How does it trap a released, oscillating bubble? How is it vented? Into what?

By playing or directing an airstream against the back of the museau, rep rates can be modulated.

Now why should one MLDB complex be at right angles and the other slanted at 40 degrees? If both are used simultaneously, path length through a melon in one can be varied against the other, thus varying interference. This of course can adjust directionality of the beam, and can cause frequency shifts within the beam. Thus a click could be adjusted to a given inspection problem.

I wonder if this is how it works?

My plane is about two hours late. I'll probably miss my connection to Dallas-Fort Worth, but at least I'll be in the air soon and on the way home. It's been a fine jaunt. I feel very good for Mats and his family. He's done very useful things.

February 13, 1991

Notes, Japan Trip

Koji Nakamura and Flip and I went to the Institute of Cetacean Biology, a long, long drive through huge Tokyo, street after street of glittering buildings, [?], traffic, well-dressed people, slim girls with bangs, and cars nudging up close against other cars for a place in line, then a wave of thanks to the car who gave way, fleets and fleets of big, blunt-nosed trucks, and tiers and tiers of windows, striped with fluorescents.

We finally found the Institute over near the docks somewhere. I could see a big vessel's bridge.

We met Director Yamamura, an affable, endlessly helpful person. He is an administrator, not a scientist. Most of our time was spent on schedule. We will go south to the Far Seas Institute and to Izu (Taiji is farther south) and stay at Koji's log-cabin villa.

Koji has been squiring us around. He and Flip are close, old divers to the last. He is a heavy-set guy from northern Japan, very comfortable with Americans, who runs a TV business for underwater film segments. We will pay all his expenses, I'm pleased to say. I like him a lot. Very open and honest. Flip says he's a great diver and photographer. With Koji driving his Subaru we thread our way around easily, especially with his car phone to call ahead.

We sat in Yamamura's office worrying about schedules and then began to discuss fisheries, including the Dall porpoise harpoon fishery. There are thought to be five or six stocks out to and above the Aleutians, three near northern Japan. We will see the southern one, which has been so strongly impacted. As I gather it, the fishery severely reduced the population at Area 1 where we will visit at _____, and has adjusted the kill by limiting the fishing season and by limited entry on boats.

February 14, 1991

Tokyo Hilton

Flip and Mr. Yamamura, operations officer of Institute of Cetacean Research took us in a blustery day to the government fisheries center—a very governmental gray building over by the [?]. We went by subway—neat, quick, crowded. We were taken out of the desk-to-desk office into a conference room where a row of blue-suited, grave Japanese waited for my questions. Flip sat back soaking it all in. He has considerable sensitivity and is not afraid to come in to help steer things. I tried to still fears, to tell them I support fisheries and have for years—what I would like to be is a balanced voice. . . . no comment.

I asked in detail about the Dall porpoise harpoon fishery. I got the regulations and their imposition. I found little out about the fishermen, their strength and attitudes, where the catch goes (I think it goes south to the porpoise-eating regions). I found that they limited seasons, landing ports, numbers of vessels, and that they imposed reporting requirements. I was given some important literature.

I switched in midstream to the squid fishery and confused my bureaucratic colleagues. My intent was to explore the bay catch, but they concentrated on squid. Flip brought us back on track.

I found that the boats are separate for the two fisheries. The harpooners fish for marlin, salmon, a few other fish, and dolphins, while the drift netters concentrate on gill netting and are sometimes tied up when the season is off. The big boats have fished since 1979 on flying squid, having moved over when a more local squid fishery declined.

The mothership fishery was cancelled a year ago. It worked mostly for salmon as I recall.

One interesting point. Pan is not allowed according to International agreement to sell by catch dolphins inside Japan. So the fishery cannot benefit from the killing of these dolphins. I want to understand this agreement, but do not.

All in all I came away with the following feelings. The overall feeling is that things are very bureaucratic. One can't ask people to wander too far.

Sociology, for instance, doesn't seem to enter the Fishery Building. I saw them as working on not very different levels, scope, and commitment to our own fishery people, who can also be narrow, but I think it could be said that they are attempting to solve these problems, just as we do. I see a bit of chauvinism, I think, a bit of defensiveness as these rules and methods change and as the Japanese face international pressure. But I do see response. The Dall porpoise fishery was unregulated until 1989. In 1988 40,000 animals were killed. It is now down to 20,000 after regulations were instituted. Whether this population can withstand a 20,000 animal take seems far from secure to me.

The fishery people talk of five populations, one around southern Hokkaido-N. Honshu and others to the north and east and in the Bering Sea. I tried to find the basis of this determination but failed. I'm not sure they know. I want to know what the population level is thought to be and if 20,000 can be withstood. I doubt it. I want to be sure I believe their figures and that these populations are not mobile entities.

I see Japan emerging. Whale decals are around, and there are evidences of an emerging environmental view. I will watch carefully.

I think I stilled their fears of me a little. They gave me literature on Japan and world fisheries ([?] is first, if I read it right), and then Flip and I went off to a sushi dinner and prawns, sea urchin gonads, fish eggs, octopus, squid, whelks, herring.

We collapsed in our rooms, a bit of the jet lag still with us.

February 15, 1991

Japan, Izu Peninsula, Ho City, overlooking Oshima Island

We are sitting in Koji Nakamura's wonderful log cabin overlooking Sagami Bay, our feet on a wonderful electrically warmed rug, after driving south from Tokyo to the Far Seas Research Institute, in Shimizu City. We skirted the base of Mt. Fuji, all decked with snow, halfway down the mountain.

Koji Nakamura drove in his new Subaru and he can drive. He also regaled us with information about just about everything.

On our way to Far Seas Fisheries Institute we stopped at Tokai University Aquarium and looked at the lovely fish and met the Curator. The tank features 24-ft. slabs of Mitsubishi plastic and a modestly interesting fish exhibit. A long, striped cleaner fish with a red tail (looked like a relative of the sea horse), garden eels—they have fine little faces and maintain the walls of their burrows in remarkably precise cylinders even though they jerk in and out. I was much taken with an exhibit of scabbard fish, elegant, shiny silver fish that stand up on their spike-like tails. I want to know more about how they live. They kept jellyfish and had made a modest attempt to do so by cylindrical flow but I understand they just replace them every few weeks.

On we went to Far Seas, which is nearby. We met Dr. Oshimi who is director, and he said, near retirement. He will retire to a position at the Institute of Cetacean Research. We traded a few stories about our earlier contacts and then went upstairs to see Toshio Kasuya who greeted me warmly and answered all my questions quickly, precisely, and directly. He is amazing and seemingly impossible to fool. I asked him first about the Dall porpoise harpoon fishery. It is concentrated in winter on the coast of northern Honshu and in summer on Hokkaido.

He said stock size had been determined by line transect cruises in the Sea of Japan, Sea of Okhotsk, and farther offshore, including the Bering Sea. His present view of the stocks were that there were two in northern Japan with a maximum estimate of 110,000 animals, and that the figure could be 3x this. One stock, which includes *P. truei* type animals is found on the east coast of northern Honshu. In winter it moves north and northeast of Hokkaido to breed (calve?). The second stock is found in the northern Sea of Japan-Okhotsk Sea in winter and moves directly north of Hokkaido to breed (calve?).

Toshio had recommended to IWC that the kill be reduced to 10,000 per year, and he expected this to be followed. This he felt would protect the population from decline.

1988: 40,000 harpooned, mostly sent south to prefectures where eating dolphins is traditional and where dive fishery had declined.

1989: Kill regulation not to exceed 20,000 by a combination of methods: 1) restriction of harbors for landing; 2) time restriction; 3) restriction in number of vessels; 4) reporting requirements differed.

1991: IWC limitation to 10,000 will be instituted (next year?)

The impression is that unregulated kill was quickly out of hand, probably severely reducing stock, but that the 10,000 regulation will bring it back to equilibrium.

I asked Toshio about the fisherman's villages and what they controlled. He said their "ownership was restricted to the shoreline and all on it and that this worked pretty well." He said the villages did not claim ownership of open water Dall porpoise stock or fisheries farther at sea, and that these were common property resources as a result and had to be regulated by his organization.

I asked about my old Scripps classmate Nonyku Nasu and he is retired and in Tokyo at NHK Broadcasting University—whatever that might be.

I asked about the drive fishery. Toshio thought it had declined because of overfishing. A century ago ten villages did it at Izu Peninsula, and only one at Futo operated two years ago. And even it did not operate last year. The catch was very heavy after war—10,000/yr. or so; by 1960s down to 9,000/yr. but declined in recent years to only two villages and less than 1,000 animals and then none. Mostly *S. c.*

Taiji to the south has had similar history in a way. In the 1960s and before it was a harpoon fishery, but switched in 1970s to Oikomi, or drive techniques. It is regulated by the prefectural government. It rose when Oikomi was introduced and has now declined due, Toshio says, to overfishing. Toshio published a paper on all this in 1985 in the Whale Research Institute Bulletin.

We left Far Seas and drove through the lowlands and up over the Izu Peninsula to Koji's villa. The place is crowded with stores, construction, people, signs in Japanese, in three kinds of characters, occasional English, well-dressed people, very few bicycles, a continual flow of trucks large and small, round mirrors to let you look down obstructed roadways, narrow streets and sidewalks, deep gutters, and big, open, high-speed freeways and flyovers. Koji drives his Subaru fast, 120 km frequently, even though 80 km may be the speed limit. He is a very affable, open, bright guy, a little heavy like me, mid 40s, [?] a successful underwater film, TV, and publishing effort with a staff in Tokyo. He is an organizer who runs things by car phone and is busy doing 10 things at once. He is just splendid to be around and a wonderful guide for us. We have saved days of time by having him help us.

What a day! We got up early (5:50 AM) and left for Mimazu Fish Market, which is about a two hour's drive from here. Koji did another splendid driving job. On the way I listened to Flip calling the *Geographic* from the car phone, and since it was Feb. 14th, St. Valentine's Day, I decided to call Phylly. It was so simple. We just dialed as were driving along the edge of Suruga Bay. Just moments before we had seen Mt. Fuji off to the left. Fred and Sus came on (Phylly was at the Arboretum). It was great. I told them when we came to a stop sign and what the weather was like, etc.

Not long after we located the big regional fish market. It consists of a couple of broad waterways, capable of handling 250 ft. (or more) of fishing vessels, and two long galvanized sheds, perhaps 1,000 ft. long and 200 ft. wide, the dock on one side and a busy truck-loading road on the other. Across the broad, crowded street were the wholesale shops, freezers, a series of tight little streets and alleys. It was bustling with trucks, hand-carts, and busy people, many in hard hats, aprons, verey intent. One had to watch out to keep out of the way and to avoid being run over.

The other impression was of neatness and the splendid condition of the fish and other products. Styrofoam boxes have taken over. We walked the length of one barn, past tiers of ice-filled styrofoam boxes, each with a perfect yellowtail, or a group of smaller

fish, shrimp, squid, even krill, seaweed, halfbeaks, groupers, [?], and large numbers of tuna, some marlin, and broadbell[?], and some deep-sea fish, squids, prawns, brotulids, cods, octopus, all iced, and in perfect shape.

Hideo Miyamoto, Futo Fisherman's Association.

There was little of the mess and smell of the usual fish market. The tunas were in the round, gill covers, and gills and tails missing, usually a line to lift them, frozen so solid they were frosted white with a coating of ice. They were sometimes stacked up like cord wood, the frost steaming like smoke. Koji thinks they are frozen at the other dock.

One area was given over to living seafood, all in green plastic containers, each supplied by a bubbler. There were puffers for fugu, snappers, and a variety of fish and crabs. Apparently this live food is increasingly popular.

We drove to the other dock—found it by accident actually, and it was devoted to seine and hook-and line-fisheries offshore. Two modern hook and line boats were full of very large, plump mackerel that were taken off in a chute and beltway and sorted and boxed. The other was a big vessel 40 m long, with at least half-a-dozen holds in the well deck that were filled with skipjack, jack mackerel, sardines, and some other schooling fish. They were brailing out 400-500 lbs. at a dip, draining it and putting it on the belt for sorting. The skipjack were gleaming and clean and perhaps 5-6 lbs. The dock was spread with large fish boxes, perhaps ready for a cannery.

We saw a little dolphin meat but no whole animals. It was cut and dark and in the ubiquitous styrofoam boxes.

Over all, I felt much in the middle of something important at the dock, and one could feel the pulse—so much greater in scope than anything I know in California—richer, more vital, and in fact, our diet since being here has been heavily from the sea, and I believe that it is correct that Japan is the No. 1 fishing nation. One realizes the importance to the people, and then one realizes the degree of importance of fisheries problems and agreement, and of problems related to dolphins that have come to affect those agreements and regulations.

On the way back to Koji's villa, he took us down through the elegant houses and corporate villas to the coast at a diving facility where Koji had worked. It was right next to Futo Harbor, which is a cement hook against a rather steep lava boulder slope and shoreline; not very large—big enough to house perhaps 30 vessels up to 50-60 ft. or so, the shore slope having been paved in about half the shore so that boats could be block and tackled up about 30-50 ft. above water laterally and maybe 20 ft. above tide, their bows against the hill slope and restrained by heavy lines. I presume this is protections from storms but it could also be used for boat repair.

The rain sheeted down, dappling the greenish gray water offshore, 20 miles or so away is Oshima Island, out where the Kuroshio Current bends in and the dolphin herds migrate by (largely *S. coreuleoalba*). It is from out there that they are maneuvered in the drive fishery, into the harbor.

We drove around the base of the harbor on a narrow, lava-margined road and out on the breakwater where the porpoise vesssel lay up against the cemented slope. She was perhaps 35-40 ft. long, open deck cabin, slim and ready to go.

Against the other shore where the opposite breakwater extended, we were able to walk down to the entrance. Piled on the breakwater was the net used to close the harbor

once the dolphins had been driven in and at the end under the harbor beacon a series of the noise makers—10-ft. pipes, a bell at the end, and a solid rod at the top to pound on, a bolt that could be loosened to let water into the lower end of the pipe, and a hook to affix it over the sail.

Hideo Miyanoko, Koji's friend, met us and told us a good deal. They were ready to fish, but hadn't this season. The market was still there, but it was difficult to drive the dolphins because of the great increase of ship traffic out by China. He said there was a reduction in the number of dolphins, but he laid it at the feet of reduced squid in northern Honshu, not population decrease of the dolphins. He knew about the various species.

We were invited up into the Fishermen's Cooperative Quarters, where three of them were having a snack and a little saki and beer. It sits in a partly ramshackle building at the dock. We were invited in by the fishermen sitting around low tables on tatami mats, split and smoked jack mackerel in a pile, and a big jug of beer and some saki, which one of the fishermen drank from a tumbler. He had a good slug.

We talked easily, especially to an older man who knew all about oikomi. It isn't very old. Only in the late 1970s it came in, replacing a harpoon fishery.

All three liked to talk about fish and dolphins. They said bottlenose were smart, sperm whales were tried, but just dived out of sight, *S. attenuata* was "stupid" as was *S. coeruleoalba*. They had caught false killer whales, pilot whales, and rough-tooth dolphins. They seemed to know what *Feresa* was. I drew them pictures.

The drive bell (pounder) had been suggested by a metal worker from down the coast, working with the fishermen.

The conversation was lively and open. Koji told me the fishermen at first welcomed divers but then banned them, but finally, given a piece of the action, the climate of opinion changed again and now their relationship was good, as it clearly seemed to be. It's hard not to like Koji.

He told me the bottom is very rich, good-sized abalones, alcyonarians, shellfish, kelp, all carefully guarded by the fishermen's cooperatives. Their success stops at the shore, though, and migratory resources aren't conserved. The fishermen probably don't understand the problem or the difference in growth of a dolphin and a fish and what it means.

One told me about seeing a dolphin in a drive give birth and then watching it try to nurse. He said this with evident compassion, even though his fishery is designed to kill dolphins. Such tangles of the human spirit.

We said our thanks and left in a downpour, grateful for this time with the men of the fishery—on back to Koji's place to listen to what may be a cease fire in Iraq-Kuwait, and thence out for a splendid tempura dinner and home to hang over the Japanese-speaking TV for hints. We all want it to end according to the United Nations' sanction.

Off to bed, after a full day.

February 16, 1991

Japan, Tokyo, Imperial Hotel

I asked Koji to tell me about currents around Japan as we drove back to Tokyo. I was interested because there seems to be rich fishing water on both coasts and it is doubtless related to the currents.

He drew this [drawing]:

I've distorted his islands quite a lot. But the current situation is indicated correctly. There is much fishing on both coasts where the currents meet and mix, and much opportunity for productivity in upwelling, downwelling, mixing, eddies, etc. the deep, or mid-depth rich water is continually or seasonally brought to the surface by one means or another and rich fisheries result. The Sea of Japan richness is seasonal. I suspect the Kuroshio is a divergence-zone phenomenon and probably relatively continual though clearly the dolphins migrate seasonally.

Together these things make Japan extremely rich in things of the sea, turn her toward it, globally. Tradition ties the nation to food sources, and they move across the seas of the earth in search of it . . . the ultimate mechanized hunter-gatherers of the sea, joined by Taiwan and South Korea, who also have traditions. Neither we nor they have learned how to treat these global resources as more than for the taking. All of us must learn to consider their health in our equations, just as the Japanese coastal fishermen have learned to care for theirs.

What about the whales. The Institute for Cetacean Research is dedicated to utilizing the whales, especially the minke. This says nothing about past depredations on whales in which we all took part, in which all our nations failed to respect the wild populations. It says these Japanese scientists remain unconvinced that whales should not be fished. I understand what they say.

Presuming that we have learned to exploit wild populations at sea in such a way that the populations are not harmed, the Japanese call for a return to selective whaling for minke whales is a balanced one—balanced with our two societies' heavy reliance upon animal protein. There is little moral justification for us, it seems to me, to condemn such whaling in view of our own sources of food. In the process we condemn Japan from a shaky platform, and one that does not, I believe, include a majority of people.

Can we exploit in such a way? Any of us? Maybe. We've been very bad at it so far. Should we? I find it hard to condemn the Japanese in this case, so long as we have learned our lesson enough to assume the integrity of minke whale populations.

To me, the call in the USA for the cessation of whaling is a symbolic call for care for our world. It falls in a world deep in the throes of a population flush so great that it threatens just about everything else we try to do. but, we must not apply our moral indignation unequally upon our friends, especially when we violate what we try to impress on others.

Hideo Miyamoto told me of watching a birth and a first suckling of a young amidst those trapped in Futo Harbor. He said it with compassion, with knowledge of his role in the death of the school and with reflection back on his own position in this drama. His voice was wistful, but he moved on to show me how he helped accomplish the capture of the school. How like me and my sheep flock, I thought. We were, indeed, in a position of manipulating death and survival according to our own needs, whether we did it with fish, squid, dolphins, sheep, or cattle.

February 17, 1991

Japan, Iwate Prefecture, Ozuchi, Hotel Otsuchi

Flip and I retreated to our posh (they should be for \$300/night) rooms in the Imperial and Koji went home. We watch CNN TV on the Gulf War, sanitized in the extreme, but with pictures from Baghdad of the bunker bombing and the move toward

retreat by Saddam Hussein. It must truly be hell in those bunkers occupied by his troops as mission after mission of bombers goes over. Koji and his very "akamai" wife Miaki took us to a Vietnamese place for dinner. Six cooks and about 20 customers and the place was nearly full. Good time, good food. Then to bed to leave early for Ozuchi up on the northeast coast of Honshu at a town devoted to the Dall porpoise harpoon fishery.

We sorted our gear down to a suitcase and took a taxi to the train station where with Koji's help we descended about five levels to the platform for the bullet train north—it travels about 230 km/hr.

Crowds of well-dressed people, a spotless station, and a spotless train. It runs due north on Honshu and may go to Hokkaido, I don't know. We went $\frac{3}{4}$ of the way up from Tokyo. It was blustery and overcast, but not cold (7 degrees C), when we boarded, each of us having a double seat to ourselves.

Tokyo is ringed by suburbs, whose main features are lower buildings and reduced crowds. Then rice paddies began to appear among the buildings, almost every space over $\frac{1}{4}$ acre has its rice. Cemeteries with big monuments and sculpture appeared on other bits of land, little tiny ones. Off to the west the land rose to snowy, tree-covered hills. As we went north the snow line came down to meet us. By the time we got off at Shinhanamaki there were patches on the road edge.

Koji took us in a rental car toward the coast, first through rolling hills with sizeable streams, little rivers really, pouring along in cobbled streambeds, and then into the mountains where the snow had fallen in earnest. Trees had limbs white banked and the road was slush. We thanked the rental lords that we were in a 4x Subaru and made the coast easily enough on a rocky coved coast, lined with buildings and docks, through a long tunnel and out into Ozuchi Bay. The town is mostly in the north area of a Y-shaped bay, protected by a cement jetty and a curved entrance. Even so, a heavy swell surged in, swashing at high tide against the quay where the porpoise boats were moored and sending a sheet of salt water up between our feet. Forest-clothed mountains, white with snow through the map of trees rise perhaps 2,000 ft. back of the bay. The town occupies nooks and river bottoms along the arms of the bay. The rafts of oyster, scallop, and seaweed mariculture pepper much of the surface of the bay with little black patches, like the heads of sea otters napping.

Koji took us down to the dock where the Dall porpoise boats are moored. They are high-flaring-bowed vessels about 70 ft. long, with a bridge and superstructure amidships and a half dozen or more dolphin darts leaned against the rigging up near the bow. Some were double pronged (the double-prongers, like [?] spears, are apparently primarily for marlin, but also serve the porpoise fishery), and more single, with an 18-ft. shaft of wood tipped with a metal rod perhaps five ft. long and then the dart. I did not note the gear used once the animal is harpooned. As I took a couple of pictures my motor drive made its winding noise and a man on the dock turned toward me silently, with body language that said "Wary, wary, I'm not sure I like you."

We made our way up the hill to our hotel set on the promontory over the harbor entrance, spun down into the snow and slush-covered entrance area, and checked in. It's Ozuchi's best—Japanese tatami mats and a low table, mats for sleeping, and slippers in a rack by the door. We will meet for dinner in a special room right next to mine.

It's cold in this place, regardless of the febrile Hitachi heater thrumming away. One has to remove shoes and don slippers. I've put on woolen socks over my other wool

socks and my feet no longer fit the slippers. I've closed the screens on the bleak, cold bay, all foam filled with the offshore storm.

So, what do I think? I'm glad I don't have Flip's job. He doesn't like it either, being pushy and [?] in a place where you're not wanted is not his cup of tea.

What I think is that a fisherman probably cannot be expected to understand why his catch has been restricted to 10,000. I don't expect him to be engaged with the question that he kills a sentient animal. What rubbish, who says? What's so different between them and a fish? They don't make you rich, either. Only a part of the Japanese like them.

What do I think about the kill in the first place? Should they take them at all? If we prey on mammals at all, I find it hard to draw the line. I'm not at all sure I hold more of a brief for Dall's porpoises than I do for cattle and sheep and pigs, especially pigs, and my society is addicted to them. As a commentator, can I condemn another society when my own so blatantly disagrees? Am I of the dissenters? I think not. I too am addicted to these animals as food and I do not believe it has ever been different between us except when animal protein was in short supply.

Well, what about their minds? Well, what about a pig's mind? By every evidence they are high in terms of mind among mammals, and yet the cubes of crisp pork I was served last night were delicious fare. I doubt very much that the Dall's porpoise is so high in the scale of mammals as the pig.

So where are we? Deep in the tangles of social values, of cultural change where things don't often make sense except viscerally, where we know things are wrong and we call for change that may or may not fit or apply to the root cause.

What all this says, I think, is that we sense on every hand that our race tears at the fabric of the earth and everything that lives in it, and we seek change by righting some wrong while dealing not at all with other equally visceral problems. What is being asked for is the larger "righting" that makes these examples cumulative. These are examples, cries of pain at that, which we wreak by the cumulative impact of our members. A Dall's porpoise's death singly, we would not worry. Done to a single species our worry would be more, but would still not engage a country, a rising swell of societies, not just in the USA, but in Europe, New Zealand, Australia, and increasingly in Japan itself, wherever people still have space to think.

It is the same in the Far Seas Research Institute as in the Institute for Cetacean Research here in Japan. They understand as well as I do.

In important ways Japan has found out how to deal with its coastal living resources and the U.S. is behind. They even have more tools for offshore fisheries, the restriction of fishing vessel entry for one. Limited entry protects species and also protects fishermen.

But for species that no one can really count, that live and move in currents and over the sea floor they never see, intersecting only now and then invisible boundaries, with no mark on land or water, we don't yet know enough. The best we can do is to touch such species, measure what we have done, and preserve the option to back up if the signs suggest we should. We probably cannot yet know with any precision what precisely to do. Yet can we back off utterly? Leaving the sea and its animals alone? Should we

condemn Japan and Korea and Taiwan and [?] ourselves for reaching out for resources from the global commons?

I don't see it in the works. I see us, humans that is, coming slowly to terms with who we are, what we need, what we eat, where it must come from. This is a buffeting ride and all around us we see limits and cautions and ecological destruction and excess. But we also see backing away, we comprehend limits, impacts, the needs of our partners. This is what the row is about.

In a curious way, cultural change seems to be done by metaphor. We seldom solve this or that. We play with the stage on which events have played themselves out. We deal with values. We argue over them. We maneuver them. We deal with ideas, not things. So it is with all cultural change, I think.

February 18, 1991

Japan, Ozuchi

Last night we had a remarkable (for me), sit-down (on the floor) Japanese dinner at the hotel. My knees shortly got the better of me, and I asked to use a chair, which seemed fine with everybody and the dinner went on.

We had a variety of raw or pickled seafood, abalone (sliced but in its shell), scallop, squid (cut ¼-in. strips), fish, shellfish, pickled shallow-water algae, lovely sticky rice and soy sauce, good beer, Suntory whisky, tea, and a big steaming pot in the table center containing onions, some kind of red meat (sliced thin), fish, and a very small, long-stalked mushroom.

Somehow we got around most of this. A very gracious, tidy woman in kimono and obe served us.

Off to the tatami mat in a cold room, warmed only modestly by the wall heater. I closed the screens against the chill world outside and slid onto the mat under a big down comforter and off to sleep.

This morning at about 5:30 AM, Koji thrust his head in the door and woke me. I was up and dressed as warmly as I could against the chill dawn 15 minutes later. Koji's loaned cashmere long johns and heavy down coat helped immeasurably. Now all I need are rubber boots. My leather field boots are already damp from the sea water [?] on the dock last night, but with two pairs of dry socks they aren't bad.

Soon we were navigating down the hill road, Koji navigating very carefully over the vitreous sheets of glare ice and onto the flat where the fish docks are located. The sun was just rising, slanting across the 1,000-ft.-long concrete market floor. We were alone. The same boats were alongside the dock as last night, breastlines outboard to pull them away from the dock in the heaving sea. The sea had been rough enough last night to break a section of the inner breakwater loose.

I took a more detailed look over the dolphin boat tied up along the quay. They are limited to 20 tons and the biggest are about 5 ft. or so, a 15-ft. pulpit extending from the high, flaring bows. The harpooner stands up on this pulpit, which is broad, perhaps eight ft. and narrowing to five ft. at the tip. I assume with his long harpoon down under the platform as a dolphin rises to blow, darts it, the flagged buoy is thrown overboard as he goes for the next animal with a new harpoon and buoy, until all available on a nearby rack are used.

There is a considerable well deck forward, with no hatches visible under the snow, the bridge house with assorted radios and radar atop and then a boxy stern with another smaller well deck, but shorter and with boards across the stern that might allow a net to be payed out at some other season in some other fishery.

A truck drove up with two True's porpoises in its open back, caught, so we were told, 15 miles offshore north of here. Flip swung into action with the two Institute of Cetacean Research biologists ____ Kawasaki, a quite remarkable free diver (did I hear he descended to 70 m?) and his assistant ____, who had previously worked as a dolphin trainer at one of the big exhibits near Tokyo.

They obliged Flip by taking samples and notes as the morning sun slanted in under the overhanging girders of the sheet-metal roof. Flip became utterly intent, a state I had never seen before, as he composed his pictures and people—enough so that conversation was not in order, only help running lenses and film. His big Nikon (F-4, I think) whispered, his flash blinked, and slide after slide was taken, his story picture. He was after a market or inspector shot that told a story, not a blood picture of cutting up.

We were given courtesy of the dock, but regarded with caution. They had been lied to before and the best we could expect was to let us be.

Flip took shots with his 15-mm wide angle, an impressive, almost spherical hunk of glass that got almost everything in one shot.

I left him working away and wandered the dock, talking to the ravens, who had gathered at an offal pile nearby, pieces of dolphins flensed out, piled, I presume, for burning.

Later, four more dolphins that had been brought up from the south appeared from under a tarp and cutting up began. Flip asked for a staged picture by the flenser and was refused on the grounds that if it was misused and he had given permission, it could go against him.

He was dexterous in the extreme, slicing off the two epaxial muscles in two long strokes of a very sharp knife, right up against the skull and spines of the vertebrae, and then the hypaxial muscles were cut loose, the ribs chopped free at their bases and then the next animal. The fins and flippers were saved and considered a delicacy, presumably because of their gelatin content (my guess).

Once Flip was satisfied and with two or three rolls taken, we drove back to the hotel for breakfast, a little coffee, and green tea and then to a break in our rooms. I try to find out what's happened in the Gulf War. It seems to be winding down. I hope so. The damage to the Iraqi army must have been horrendous. I can image those soldiers down in those underground bunkers, being pounded by carpet bombing with little food or water, [?]

I wonder how long the images will persist for them? Probably for their lives, as it was for many Viet Nam veterans.

After a noodle lunch (Koji is very high on noodle lunches with tempura) and fish tempura in broth and some green tea. Koji is remarkably fast. I just get started unsnarling the things when he is done.

A word or two about Koji. He is a very open, social person, porky, even more than me, very smart, very observant and energetic, and apparently a splendid driver and photographer. He has a company that provides films for a big TV quiz program about animals. He's a fixer and entrepreneur and world traveler, as a photographer. He is

wonderfully direct and uncomplicated about all my questions. He's into publishing, writing, TV, photography, and more, and a positively wonderful guide. I have such a feel of things from him. He's also subtle and ahead of us much of the time, I think. Wonderful getting to know him. He and Flip have done many things together and there is obvious trust between them. So pleasant to see that such values and approaches work across between our two cultures. I'm afraid the Japanese expect us to try to cheat them when there can be another way.

We took a drive to the big steel[?] town one cove to the south, walked through a fine fish market and then cruised the docks and had our noodles.

I suggested a drive to the north would be good fun, so off we went to a town that has an old whaling station (we are holding it in reserve as Yamamura of the Institute of Cetacean Research will join us on our last day).

The hills are being very actively forested, cut, planted for conifers at least—cedars and a lovely red-barked pine. We stopped at an almost perfectly circular bay with a narrow entrance between mountains, off to the north.

I'd guess the bay as two miles across. It is literally peppered with the rafts and floats of mariculture—oysters, scallops, algae, I'm told, and the shores are protected for tsunamis by big cement walls, behind which the highway runs and villages hide. The beaches are clustered with piles of cement "jacks" to absorb wave shock. The towns are clean, roads well maintained, and the place has a progressive, well-tended look.

I've seen almost no slums or poorly tended areas or buildings decaying, even though we are far out in the hinterlands.

When I asked Koji how they regarded children, he replied, "as angels." They are indulged even into their 20s, when many try to find their own way, but the family remains. He worried about the high cost of housing, saying that a retiring executive of a big company could not afford a place in downtown Tokyo and that new families, of course, were much worse off.

Tonight the two biologists from the Institute of Cetacean Biology join us for dinner, and tomorrow Flip will give another try at photographing the market. He's pretty satisfied that he may have a publishable picture. He's very interesting to watch. He watches light carefully, knows how to fill in and choose the time and place to do it, and what problems a particular subject poses. Especially, he composes the picture in his head to tell a story. He's subtle about being intrusive. Given a chance, he will spend days winning people to his side and then photograph, but if he needs to be will photograph in a difficult social situation, though that hasn't yet happened.

He said a rule is "F8 and be there"—that is being at where things are happening is more important than photographic technique. He keeps few slides. He says his whole collection may number no more than 1,500. He certainly doesn't burn up film or deeply cherish cameras. He uses them. I find him very perceptive, honorable, and a super guy to be associated with. Things at the main headquarters seem tense, however, in the wake of the recent shake-up. I have few illusions that my deathless prose will survive close inspection.

February 19, 1991
Japan, Ozuchi

It began snowing toward afternoon last night and continued all night and is still snowing now at 4:00 PM. The hotel, which sits on a promontory up above the harbor entrance, is banked with snow and the forest is decked and bent with lumps of snow that fall and scatter in white cascades and the limbs spring up again.

The bay is all but obscured though we can watch a lone fisherman in an open boat tending his mariculture rafts through the swirling snow and then beyond all is white.

This morning at 9:30, we drove down the hill following a bulldozer truck between the banked edges of the road. Animal tracks wandered in the fresh snow. The 4-wheel drive Subaru we had rented negotiated it all without a hitch. At the Fishermen's Cooperative Building we met with a fisherman, the owner of a vessel, to talk about conditions in the fishery. I was expected to ask questions and must say I found it an arid event at first, not having much in my mind, but later it became interesting.

I asked about harpooning and harpoon boats.

The most interesting thing I learned was that the boats did not fish for much besides dolphin and marlin and once the season and quota was up, they might not fish at all and the fishermen got other jobs, such as those in construction.

Nearly all the answers came from the owner of a dolphin vessel, who told me his family had been involved for four generations. Later, he told us he was pessimistic it would continue for long into the future.

He expressed gratitude that we were not activists, whom he obviously was disturbed by. I asked about how far they could fish and he indicated they might venture to Hokkaido.

He told me that the older fishery used guns to kill the dolphins, but had turned to the more secure harpoon. The porpoises in this area ate mostly small squid though elsewhere they ate sardines or larger squid. He said they were easily caught when they started feeding.

He told us that the fishermen had built a buddhist shrine to the dolphins, which spoke of a relation between the fishermen and the dolphins and its continuance.

He questioned the new regulations (10,000 annually) and whether Toshio Kasuya could be trusted to change his views if facts indicated it. He was not sure his fishery could survive the new rules. I mentioned that dolphins are not like fish and may have only 8-10 babies in a lifetime, the first baby at 7-8 years, and the last at 30 or so, but not every year.

I was corrected by Saino, who said that new info for Phocoenids indicated a lifespan of about 15 years and a first pregnancy as early as 3 years, when it reaches 6 ft., though still about the same number of young.

We left about noon and headed north with Mr. Yamamura to visit a whaling station (mostly for sperm whales) north of here, with Kawasaki and Saino.

First we stopped at the Shinto shrine, very close by the fish docks. Three polished basalt slabs inscribed with characters were in front of an old lacquered house. One had the names of contributors, which included townspeople. The second, elegantly inscribed, said something like, celebrate and pray for 1) a good catch of dolphins into the future, and 2) a good death of the dolphin, and a happy afterlife.

The impression was of a tight, animistic relation between fisherman and dolphin that tied the welfare of one to the welfare of the other. Shinto is tied closely to the emperor-god and can be chauvinistic at times, I'm told.

Once the Oikomi fishery declined and whale meat became hard to get, there was a new demand for dolphins, which became satisfied by the rejuvenated Dall porpoise fishery, the meat being shipped south. The kill, which had been hovering around 8-10,000, skyrocketed to 40,000/yr., which alarmed the fishery biologists at Far Seas.

Kasua and crew began a study that outlined populations and movements by lane transect means. The fishery was first limited to 20,000 and then to 10,000. Population estimates were as low as 100,000 if I understand it correctly. This corresponds reasonably closely to the old take during the earlier kill that was sustained for a very long time. Certainly this level is likely to be sustainable, but our fisherman told us he doubted that his 4th generation could go on for long. Perhaps the problem is simply economic. Dolphin meat is not prized. In 1991, it brought 150-350-370 yen, or 500/kg at the highest, while salmon brought 800-900 yen/kg. And hamachi (young yellowtail) brought 3,000-10,000 yen/kg. Dolphin meat is cheap meat, can be very strong, is very dark, and only used in some places. I suspect the fishery hangs in the balance, but I also think the Japanese research establishment and fishery people have acted responsibly.

The conformance of the fishery to these rules is enforced to a degree by the market, which can be faced with severe consequences if it buys banned products. It can be sold illegally, but both seller and buyer face severe consequences and in such a traditional society with traditional fishing groups, one has to be a renegade to buck the rules. I suspect they do conform.

Like fishermen everywhere, ours didn't like the state of affairs much and doubted that he would continue.

We drove north in the falling snow to a planned whaling exhibit, finally found it next to a field white and deep with snow. We went inside for tea. The company provides McDonald's with fillet o' fish, which is cod or pollack, some Russian, and some jobbed through N. Korea. They fillet it, pick the bones out, stack it up, freeze it, and stamp out square pieces.

We drove back through the snow to our cold rooms, for dinner at 6:00 PM. I had pork cutlets for lunch and am not sure how much more I can eat. The amount of food, 85% from the sea, one can eat begins to be a question. I had tunicates in kim chee sauce last night.

It's cold in this room. I've closed the screens and the heater barely warms my hand and the TV is all in Japanese, mostly men in business suits sitting side by side discussing I know not what or sweet-smiling girls in bangs advertising drain cleaner. Bangs are very big here. There are remarkable examples to be seen that blow up in the windy streets but fall back absolutely in place. Ears are big, too.

All in all, I like Japan and admire the orderly society and its gentility, though I know what competition lies just beneath the surface and what chauvinism as well. But I also think a lack of understanding of the rules on both sides has led to Japanese expecting to be cheated by Americans, and vice versa. Not a good situation in people as similar as we two are.

Flip and Koji and I had dinner with Mr. Yamamura of the Institute of Cetacean Research. He has been on a catcher boat and then on a mother ship in the Antarctic on five expeditions. We talked over many things and listened to him tell us his experiences.

He said that the Fisherman ____ Ogomi we talked to this morning is the best supporter of scientists in this Fishermen's Cooperative, very traditional and very concerned about the fate of the fishery. Gradually, the traditional boats and their fishery are begin invaded by others with no tradition. His is four generations long and he cares for the dolphin and the resource.

The use of dolphins took its burst to 40,000/yr. at a time when more than just the decline of the oikomi fishery was occurring. It also coincided with the reduction of the sperm-whale quota by the IWC and the replacement of this food by dolphin meal, and by the reduction in minke whale meat and its replacement too.

He told us of Taiji whose tradition goes back 13 generations and then disappears in antiquity. The Taiji whalers were licensed by the shogun and were his secret navy. Their coordinated maneuvers, which were accomplished with flags, have evolved into the maneuvers used in Oikomi, or the drive fishery. I find this melding of tradition with the obtaining of food, and its melding with the almost animistic aspects of Buddhism a fascinating exercise. The realization is that even though you take food from an environment, you too are part of it and its [?]. It is timeless and what the dolphin harpooner talked about.

Mr. Yamamura told of how brave the Taiji whalers became. When first they set to sea to catch whales, after finding that Russians and US? were fishing off their coast, they tried and their traditional boats were broken up. But finally they succeeded. One brave whaler was charged with pumping on the whale's head before it died from lancing, cutting the frenum of the nostrils and tying a rope through to prevent the whale from sinking. Then the whale was killed with a sword thrust to the brain.

I am struck by the dimension of time in the culture here, so often lacking from our own and how tradition can work to protect the world because it involves stewardship, participation, responsibility, that is so often lacking in our own raw approach to the natural world.

Hopefully, the Iraqi war is winding down, now that Gorbachev sees a role and a responsibility. I hope so.

A word about food. there has been so much of such variety that I've had to hang on by watching how much I ate, or else I would have had trouble simply from overeating. Most food has been traditional and most except rice, from the sea. All is served with grace and beauty. The bowls, the miso soup bowls, made to squeeze a little and break the vacuum as the soup cools, the shaving of onion, the sprigs of algae, the tiny clams or gastropods, a piece of fish, soft salt salmon was a favorite, sticky rice, dispensed with chopsticks, sea squirts like big vegetables—roots that went in among the rocks and a soft, iodine-tasting interior—green tea, side dishes of vegetables, cabbage, okra, a little packet of tasty nori to wrap around rice in a single, swift maneuver of the chopsticks, Asahi beer, and a beautifully designed bottle of Suntory whisky on the side. Very tasty yellowtail, slabs of deep red bluefin tuna (ahi), scallop sashimi (delicious), oysters, prawns in their shell, a big pot set in the middle of the table with an alcohol burner underneath in which a collection of seafoods were dumped in a kind of broth cooked till steaming, and we all shared.

There was much more that slips the mind. All was graceful and gracious and the conversation good. Koji is a fine translator, not at all slowed by his accent as some are. He was more than that—a sharer and interpreter for us. With the fishermen he gave them a considerable lecture that did much to clear the air and open the way for us. The climate was noticeably more open and accepting the next day.

February 20, 1991

Enroute to Tokyo on the bullet train

We were up at first light. It was cold and clear and the storm was gone. In its place was a deep blanket of glittering snow, branches laden, the roadside banked three ft. deep, the road itself slick and treacherous with ice under the snow. The harbor lay calm in the apricot light of first day.

There were no boats out last night so our hopes were slight, but down to the market we went anyway, all bundled in our down jackets, long johns, and caps. I walked the dock in the frosty morning through the glittering snow to photograph the idle catcher boats. A little boat, a single fisherman at the tiller, putted up and put a hoop-net full of eels ashore. A pickup with two bushels of flatfish and sulkin came up, their catches weighed and accepted.

Then surprise, surprise, the crew of the Oikomi dolphin boat drove up, after what looked like a night of partying and said they were about to unload 15 Dall's porpoise caught five days before.

Soon the hold was opened and the dolphins swung out one after the other to be picked up by a big, long-forked dolly, and rolled up and arranged in a row for sale. Only three buyers were there, but all were bought. Flip was in his element. He became very intent and professional, bracketing shots, changing lenses and light, and nothing seemed to escape him, even though a wind swept down from the mountains of the bay and it became fearfully cold—cold enough that my power winder only worked fitfully. The fishermen in blue foul-weather gear, the red harpoon flags, the black-and-white dolphins against the glittering snow in the slanting morning light were indeed a scene. Once lined up inside, Sanio and Kawasaki started work sampling the animals and Flip moved in.

His best shot he thinks is of a woman buyer pulling her newly bought porpoise out of the row with a gaff hook.

Flip was visibly elated since he thinks his picture is “in the can” of a market shot in Japan. I'm very pleased about this as I was at least partly responsible for the tight schedule that allowed little slack for waiting, a thing a good photographer of subjects such as these must do.

Back to the hotel for a big, diverse Japanese breakfast, checkout, the drive through the snow in our 4-wheel Subaru and then aboard the swift bullet train (they leave about every hour—we waited 15 minutes). These things go 240 km/hr. and they are gracious and nearly completely smooth. The directions are given in both English and Japanese.

May 8, 1991

Hawaii, Honolulu

I drove to San Francisco, boarded a plane, and flew to Honolulu. I was met by Ken Marten, who took me to his lovely little stash at Lanikai Beach, where we met Annie. I think they are doing well, though Annie is shifting jobs because her position at Castle as a psychiatric nurse had become a difficult physical holding action of very long hours. She'll move into a quality assurance program.

After lunch we headed for Sea Life Park where Ken works in the basement of Bateson's Bay with four *Tursiops*, under sponsorship with Earth Trust environmental group.

It was well worth my time. They are hard at work on the driftnet issue and gave me much material.

The three principles were Donald White, Susan White, a lawyer-biologist. They are also working on the Taiwanese drive fishery.

I support Ken. I thought they were very bright and knowledgeable. They had broken away from Greenpeace, which they felt had become undirected and not cost effective. They were obviously lean and directed. I thought they were pretty formidable. The director was planning expansion. I wondered if his organization would one day be swallowed up as Greenpeace is becoming [?]. I may send material to them for checking.

I came away realizing anew the vital part these citizens groups have begun to play. They are increasingly informed watchdogs, and increasingly one sees their names associated with United Nations and other governmental decisions as participants rather than merely as irritants. I say their role is vital because there is a critical need for proponents of other than exploitation of resources in human terms to have a say about the fate of the natural world.

Fisheries Commissions and agencies are, in a word, too much in bed with the fisheries they regulate to be effective in world terms. These Earthwatch people are sophisticated and critical observers.

May 9, 1991

Hawaii, Kona Coast

Jan and Ania live up the hill from the Kona Airport—up 700 ft. or so, above the lowland heat where breezes blow and it seems 10-15 degrees C cooler, showers every afternoon, in a nice, open, three-bedroom house. Jan has a room below for his scars and marks work. He has identified 200 dolphins about, and Ania pursues her work on the afternoon arousal. I haven't yet pressed for details but will soon.

The weather is beautiful, not yet summer, and very comfortable.

May 10, 1991

Hawaii, Kona Coast

I spent the morning reading material given me by Earth Watch and getting my act together. I'll go out to the Waikaloa facility in an hour or so, with Holly Green. Holly is preparing for her impending wedding and waitressing on the side to survive. Her pal lost his job with troubled children in the Santa Cruz school system in a general educational cutback. Tough times. Jan and Ania seem to be doing pretty well—the Musgraves are a major support.

My impression of Ken's work was that he is to some extent "released to do his own thing" and doing better than at UCSC. His work still lacks scientific forms—he is shying away from conditioned-response training for ideological reasons.

We watched some elegant bubble behavior. The dolphin seems to blow a bubble and catch it in a boil of turbulence, which spreads the air into rings, some long and necklace-like.

Sometimes these bubbles become entrained in the oscillatory flow past the flukes, and become long, very beautiful trains.

We were met by Ernie and Rog Corgell for dinner. Rog is retiring and will retain a position on the Sea Life Park board. Ernie is doing very well as a Vice President in a 350-person company with six stores. Lovely to see them.

Well, soon I'll get my act together and go out to the hotel, which Pam told us is an American Taj Mahal.

In the afternoon we went out to visit the Hyatt Regency Waikaloa and Dolphin Quest, on whose board I sit and whose facility I have never visited. It is a Taj Mahal without an evident theme. There is a lot of Asian staff and a few grand-scale staircases, a lot of lovely plantings, a beautiful lagoon, a tram, a canal boat, and no evident theme unless it is a low-level Angkor Wat without gilt (guilt?).

The dolphins were splendid. They are held in an upper 20-ft.-deep lagoon with a shelving sand beach on one side and the building and lawn on the other side. It's maybe an acre of water, clear as crystal, with little fish cruising about.

The female training staff was arrayed in spiffy orange suits that don't conceal much noteworthy. They do much work in shallow wading-depth water and the animals are puppy dogs.

May 11, 1991

Hawaii, Kona, Kula Nai'a Project

We got up at 7:00 AM or so, had a little breakfast, and made our way down to Honokohau Harbor, where we loaded our gear onto the *Smygtittar'n*, who lay at a mooring below the restaurant at the Coast Guard dock.

Hanalalai was decked in clouds halfway up but the sea lay shining below us as we drove down the long lava fan to the shore.

We carried our gear down the dock, loaded it aboard, cast off, and made our way slowly out of Honokohau Harbor. On board were Tom Freeman, a psychologist from Massachusetts who works with self-abusive adults. He's here on the Herman Humpback project—under Alan Frankel; Holly Green, who has moved here to help with Kula Nai'a, Jan, and Ania.

We took the *Smyg* out, and cruised northwestward 200 m offshore toward Keahole Point. We doubled the point, skirting along the OTEC referral power facility that extracts energy from the warm surface water above the thermocline and then generates power in a low-pressure turbine.

On the north side we entered Ho'ona Bay, a little bay that drops to 30-40 fathoms very close to the edge of the lava flow (100-240 ft.).

Soon we sighted a school of spinners coming into the bay from the north. A few animals left and one or two spun as we closed on them. Jan gave the command to lower

the chamber. Tom, Ania, and Holly knew exactly what to do. Jan and Ania lifted a little winch into its collar, taking weight off the locking bolts, which were then removed. Jan and Ania winch the chamber down into its combing where it finally sits. All four place big stainless locking bolts and tighten them in place against the ship motion, with big wrenches. Once done the air and exhaust hoses are put in place and the air system turned on so that a constant stream of clean air flows over the windows deep in the chamber.

The hatch is opened and bungeed in place against the swell. Blue light from the clear sea floods the chamber as I climb down the aluminum rungs and take my seat, don headphones and microphone. Jan and I check our communication link, which the lookout forward can hear. Holly, the lookout, across the cabin talks us in to the big school. Jan says there are 50-60 dolphins coming into Ho'ona Bay. They move daintily, little quiet surfacing, scattered in clusters of 2, 6, 8, 12, as we approach, and soon I see them, gray shapes resolving out of the blue veil, gliding, and then beating their flukes, and swooping in within a yard of my window. So close I can see the dolphin's eye fix on me as it passes.

It is an immaculate animal of dark back, white belly, long, slim black-tipped beak, of remarkable grace moving in hydrospace.

8:00 AM.

I came up and surrendered my place below to Jan, grateful for the air and the steady horizon. Two years away from the water have edged me back toward landlubber status.

The view from the chamber is spectacular—full view from the nearby surface to deep below down to the gleaming and shadowy coral sand about 180 ft. down. Animals are full frame. It is no trick at all to see their sex, to watch as far as you can see to each side. But I'm glad to be topside to recover a little.

The sun slants down from Hanalalei, its top hidden in a veil of mist. Ho'ona Bay is edged in black, jagged lava, a bluff not much more than 10 ft. high, yet giving and receiving the swell from the blue oceanic sea. A pencil line of turquoise lines the black and then the [?] glinting sun. The sea heaves and sighs. At its peak it rushes white and spurting through the manifold crevices of the lava, jetting high in plumes of foam, to flood back in cascading rivers and falls of foamy water.

Dolphins crisscross the bow, Ania and Jan on ID know 200 of them personally. There's Wart and Forenip and Nubby, Low Notch, Sharky, Big Fin, Tweaky (who has the tip of his fin tweaked as if a tie on a loaf of bread were twisted).

The dolphins are brown-backed, colored by the reflected light of the blue sea. they slow and flow around us, a yard or two from the window down below. We can see that ahead is a group of 12 adult males, a coalition, their tall, triangular dorsal fins obvious and their muscular humped tail is clear to us after our time of learning to know them, but obscure to the newcomer. Our eyes have come to see, just as we learn eachother's faces.

We enter a mixed school, mothers with young tacked against their sides, or riding high on momma's side, the drafting position where they get a free ride. Four Nips is there where he was a decade ago, an adult male then, and still an alloparent, a male caretaker of the young.

Ania hands the camera through the cabin window for more film, and then turns to the school, her motor drive muttering as she documents the tiny nicks and scars of all the dolphins that will let the couple reconstruct the dolphin society slide by slide, over months' time.

A dolphin spins dead ahead of the bow in a blur of [?] as it spins and falls back, and the observer below watches [?] its spiral of form, 12 ft. down, a designed sonar target for the other dolphins that can define the moving fluid dimension of the school

Back on shore, we wander through the giant stores of Kona for food and a toothbrush and a bottle of wine and then back to the comfortable house on the haunch of Hanalalau.

May 12, 1991

Hawaii, Kona, At sea on Smygtittar'n

It's a not-quite-blue morning-haze and a cloud deck offshore and haze in the air over the harbor as we climb aboard the *Smyg* and head for sea. Though there may be a swell, the air is all but still, waving the hale koa but not much more.

We load and head out. The *Smyg* is waterline level with the sea. Only under full power does the bow come up and even then the 4,000 lbs. of ballast anchors her like a rock in the water, resistant to forces that would rock a normal boat.

We're at the entrance now, traversing the turquoise water for the deep blue beyond.

We cruise north in low swell and chop toward Ho'ona Bay and beyond and encounter the school at Kakapa Bay just south of Kihola Bay, which was the northernmost place we saw dolphins in my study.

The bay is a shallow indentation north of the Cinder Cone above Makalawena. The dolphins were found 200-300 yards offshore moving slowly south. There was Four Nip in his group of juveniles and adults. The haze is dissipating a little though clouds hang over Hanalalau and Kohala and a veil of haze lies in the gap between Mauna Loa and Mauna Kea.

Jan commands lowering of the [?], a tricky business in the swell. Tom and I take out the retaining bolts and stand back as Jan takes the strain of them and then the chamber goes down restrained by the whining winds and then once down in its collar, the big bolts are run in place and the chamber is secure in the down position, a flat indicating "[?] percent" is attached and the air hoses put in place, and the hatch secured open with a bungee cord.

Holly, at the helm, runs the *Smyg* into the swell. The water is blue and oceanic though I can see a mottling of dark coral on the bottom, perhaps 30 ft. below.

The sun glints off the blue swells now, a thousand mirror flashes as the day grows clearer.

Up ahead is hotel now and the Hyatt Regency Wakaloa, the Taj of all Tajs.

A half-grown baby spins, silhouetted black against the sky. The shallow water, the swell, and the great weight [?] water chamber down jerk us this way and that. The motion is more uncomfortable topside than down in the chamber, since the vessel totes about the lead-tipped chamber. Jan goes below to sex dolphins, his work more important

than tending to the whines of his Sr. professor. I like that. The baby salmon leaps ahead of us and now spins, its pink stomach evident on every burst from the water. Head over tail combined with a spin, a crazy melange of flukes, flippers, and motion. Another motor boat ahead of us, splashing staccato blots of white against the blue sea.

They came to the chamber, little dots of dolphins, the [?] grown spins on the beam, 40 yards from the nearest other dolphin, a sure sign that all is well. Thereafter [?] bunch tight at fin-tip distance and maneuver as one. That distance is also a measure of their society. Only when they are undisturbed does dolphin sociality intrude, caressing that the Hawaiians call "porpoise work"—Hana Nai'a [?] Frightened they become a fish school, a group organism capable of creating illusions in the minds of predators that defeat their attacks.

Four Nip goes by in the company of a sleek juvenile. Only one loose tab of flesh remains on the trailing edge of his dorsal fin when a shark attacked him. When I knew him a decade ago, there were four, and even then his job seemed to be with the juveniles—an alloparent, the behaviorists call him.

The [?] dolphins laze along at our bow. When they descend into rest later in the morning they will turn shy, their sounds will stop, and they will enter what passes for spinner sleep. They will bunch and one eye or the other will close, and they will go all but silent. They will leave the inboard-looking eye open, the events of their school more important than environmental information, since other dolphins are alert. Only a low crackle of occasional clicks will guide their way. We move south now.

The baby still spins, obviously in an aerial bout, its leaps mostly head slaps now. I haven't seen a decent spin for a few moments. A phalanx of dolphins races in the face of a swell that sweeps past us from astern, the tips of their beaks breaking the face of the swell, or even their foreheads as they rise for a breath, or they race along inside the swell face, the tip of their dorsal projecting [?] arch into the air sending a trail of white, like water squirted from a bottle. The fin tip is a fender guard!

We're off Makalawena now, where Jody had her great adventure, I can see no trace of Sam and Kinu's beach shelter or Jody's dancing platform. Time, time. It passes and things change.

The little dolphin, if it is the same one, still leaps and spins on our beam. I think it's the same animal. It's in the same place in the school and the same small size.

A chase ahead of us leaves a rooster tail of foam and the rapid beats of flukes on foam. No spins for a while now. Some animals at 50 yards apart and some always seem to be flirting with our bow. A larger animal spins ahead of the starboard bow, nine times in a row, some good, some a single [?]. Another burst of four.

We watch and lose the dolphins. Have they turned back? Some looked as if they might try to evade us, so we circle and then turn back, but no dolphins. On down to Ho'ona Bay, and there we find them again, hand against the southern shore of the bay—tightly clustered this time. They dive and are gone for four minutes and reappear clear across the bay to the north. Another couple of dives, random surfacings in the bay and the rest pattern was obvious, 3-4 minutes down, zig and zag slowly, no aerial patterns and no plan. Jan decides to leave them to their rest and so we break off contact, haul up the chamber, secure it, and head for home port.

We skirt around blustery Keahole Point past the Pine Trees and into Honokohan Harbor, where we moor in the ship to Coast Guard reserves for confiscated boats.

Jan directs the cleaning of the boat, wash down windows, lock her up and flush the engines and then home at about 3:00 PM. I'll finish interviewing Jan and Ania, probably today.

May 13, 1991

Hawaii, Kona

Catch-up day at Jan and Ania's.

Quote from Cynthia Moss re impalas.

M. Jarman showed that the original isolation of the mother and young at the time of births is important, not only as an anti-predator device, but in allowing the mother and fawn to learn to recognize one another. When a fawn was born in the vicinity of the herd, the female was harrassed by the territorial male, and by bachelors, females, other youngsters, who immediately surrounded the newborn fawn and confused it. In these cases the fawn tried to suckle and follow animals other than its mother, and it was clear that it could easily "imprint" on the wrong animal.

Perhaps the parts of this one are as follows. When a baby is born in a school of dolphins it is an event in which the anonymity of close-to-identical school members is badly disrupted by the inappropriate size and behavior of the young. It must be a very vulnerable time in open hydrospace, not only for the young but also for nearby school-members who can be fixated upon because there is a place to fix attention in the school (the blue fish). So one would expect segregation to occur within the school. There should be a "place" in the school where moms and babies go, and where they receive support from the school. Is this in a "playpen." Do males and others shunt the female young to this area? Is this also happening with impalas?

Is there a testing of the fitness of the young, at this time. Investment is least at this time. "How realistic is this, considering the very considerable investment of a mother for her new fetus?" Are young to some extent expendable?

So what does the school do at birth? What do adult animals, male coalitions, do at birth. Wouldn't it be exciting to observe!

Back to the story. A couple-team of young behaviorists learns about the lives of wild dolphins. They do so with their and my vessel, *Smygtittar'n*.

They search for understanding about who these almost alien mammals-on-earth are. Who are [?] that in other sectors of the human equation deal so cavalierly with them, [?] in gossamer nets as strong as steel and discarding them back to the sea by the hundreds of thousands and now no place is safe on our globe, no remote fastness of untenanted sea can their evolved ancient pattern of life go on without the heavy and thoughtless hand of a removed civilization from ashore blotting out uncomprehended lives and societies at sea without a backward glance. Who are these ciphers?

Jan and Ania patiently pile piece upon tiny piece of the equation, a jigsaw puzzle moving toward understanding. She the pattern thinker, he the careful builder of pattern.

She who dreams of what dolphin society is like and he who patiently learns the players, who they are, where they go, who they associate with.

What does their search tell them?

All of these, my students and their and my colleagues, build upon my own past explorations, 38 years spent mostly with spinner dolphins, and yet the picture is only now coming into focus for us.

A mammalian society in 3D hydrospace.

A society that works on and off, not it is here and now under threat disappears into the anonymity formation like of a fish school, where all animals are as alike as they can be and the predator mind and eyes blink in confusion confronted with faceless passing ranks, all alike. The headlong predatory rush fails as its mind blinks, dotting and predicting the course of its trajectory, to fail as prediction fails, and it wallows in uncertainty, fins fanning, precious energy that cannot be often spared, lost.

May 14, 1991

Hawaii, Kona

Up this morning at 7:00 AM, a quick breakfast. Say goodbye to Java and Harpo and listen to Midori the male parrot scream because we are leaving him.

We drop down under the cloud deck that clothes the upper slopes of Hualalai. We board *Smyg* and head out the harbor where we meet a small school of spinners—perhaps 20 animals at the entrance. Jan circles and we do a little ID and then head off up north. The day is quite calm and save where the ocean rides up over shallow banks and reefs the water is rather quiet. Even so, tosscaps prick the water at the tip of Keahole.

We pass by two mantas, the tips of their fins bent up like [?] as they laze near the surface.

A big school of spinners was encountered at Mahauila just south of Jody's Makalawena. Jan goes below first. He takes his captaining seriously and the water is shallow enough for him to worry about the capsule hitting bottom—so I come second. I don't object, knowing how important it is not to insert myself into a well-oiled, careful and efficient operation. He is careful from A to Z, the boat and engines are washed and flushed at the end of the day and two dozen other details checked.

I go below in the chamber, clambering my difficult way to the bottom, where I settle in to the swivel chair, the big rectangular ports ahead and to the sides (the back two are blocked with a towel to prevent reflections).

The water is clear blue, the banked coral heads gleaming and each with a halo of reef fish, kiki-kikis, surgeon fish, black triggers (humu humu ele eles). The immaculate long-snouted spinners are now all around me, they flirt with my capsule, look in at me, and on some unknown signal, they angle downward at 45 degrees toward the distant coral and sand 100 ft. below, turn a dozen ft. above it, and cruise, [?] as ghosts to level out 20 ft. above the heads and slide along in what we came to call a "carpet formation."

They head for Ho'ona Bay, a favorite sleep spot. Half an hour later we are there. They slow and tighten their schools into silent knots of dolphins, at fin-tip distance. The school becomes wary of us, half its members alert and on watch and the other half with one eye closed. They maneuver away from us.

May 15, 1991

Kona

Tesseract day. We spend the morning hours cleaning the Tesseract (actually Jan and Tom Freeman do it). Ania wrassles with accounts and I read about baboons and lions in Cynthia Moss's good book. We will stay with the dolphins until dusk to see if we can record the evening chorus. I sign over checks to Kula Na'ia.

I invite Toni to come visit us in Santa Cruz, and Holly prepares for her August wedding. Much peering at wedding dresses and talks with seamstresses.

It's much hotter today, seems to me, than earlier in the week. But the sea is calm and the dolphins accessible. Ania has a new hydrophone, obtained from John Ford's wife that Ania will use. It's reportedly good up to 25 kHz.

Tonight John Stern has invited us to his house for dinner. He says he has a grand fish recipe and allows as how he loves to cook.

The clouds begin to sweep down off Hualalai and here on the hillside, it grows cooler, but I can still look out over the lawn fan to the sea edge and tell that the sun beats down there with unremittant force. We'll be hot, I suspect, aboard the Tesseract.

So much detailing.

May 16, 1991

Kona

We're in Tesseract at entrance to Honokohau Harbor. Jan stops to talk weather into a tape recorder. Wind shoots to W.

We go north, the Tesseract slapping along. She's twice as fuel efficient as a similar Deep [?] boat but she's also an aquatic skateboard with little to promote stability. The way one deals with her is to imbalance the boat so the chine digs in a little.

We headed north into a considerable chop and swell. Tom had seen a "wind line" to the north—a choppy horizon and over it a wispy lower margin of the cloud deck. The sport fleet of white bobbing boats with dipping outriggers and white bow waves, had made its way south off Keahole. We slapped and bannged our way north, and no dolphins appeared.

We backtracked to Ho'ona Bay, where we bobbed quietly waiting for the furtive sleeping dolphin school to surface. It never did.

Jan steered the Tesseract south along Kailua shore, along the hotels, to Maihi Bay and Red Hill (a cinder cone sliced in half, exposing the inner core of the vent.) On down to Kealakeakwa point and light. It all seemed very much the way except that upslope a couple of long golf courses had been hacked out of the Hale Koa.

Finally under lowering clouds we rounded into Kealakeakwa and up under the black cliff. The water itself was dark ink in the sinking late afternoon light.

Black fins and backs appeared not far offshore and soon we were in a considerable school of 40-60 dolphins, including some quite small ones. They were in the first stages of zig-zag swimming. A few head slapped, a desultory spin or two, they move laterally, speeding, then slowing, and back into quiescence, then another burst. In and out, out to the bay mouth and back again. We followed them until 5:45 PM when it was perhaps $\frac{3}{4}$ hr. to dusk, but the sun was low in the west.

The dolphins oscillated faster, slowed, raced again, with concerted leaps forward. Then, as we cruised ½ a mile outside of the mouth of the bay in the gathering darkness, the school burst from the water in cascading floods of animals, moving at high speed.

The change was startling to all of us. "Wow, look at that!!" We cruised along as the school raced in a magnificent arc around us. Black silhouettes cascaded against the black mountain and the dark rainclouds. As they arced, they became better [?] and their patterns became evident then, abruptly, no more than a minute later they subsided into the sea and resumed their slower progression northward along the shore, half a mile out.

The big peak in the oscillatory course of zig-zag swimming. I'll bet if one plotted the oscillation one would find that they nearly reached crossover speed four or five times before, and on this occasional they did it wholly, and then, as before, oscillated back to a lower state.

The crew of the boat was getting antsy about being so far south with so little gas. So, we turned north, Tom at the helm now with Jan below trying to fix up the running lights (he did).

We made it to Honokohau after darkness. The green buoy guided us in to the red buoy (red right returning). We put the boat on the trailer, washed everything down and headed for home. It's all the 4-wheel International Scout could do to haul it up the hill.

A good day.

I prepare for the Breese visit this evening. I'll do some shopping and cooking.

It was good seeing Paul and Jeanne, who is wonderfully good for him. He has control of alcohol now and seems very clear headed with his memory as intact as ever. He immediately told us all about the eclectus parrot, where it came from, problems with keeping it, and so on. John Stern was there too, a very nice guy and Jan says, his best friend.

Well, tomorrow I head home. What's it been like?

Well, Jan is wonderfully capable and so is Ania, in very different ways. Their lives are wonderful in their way—the two loving dogs barking when they come home, obediently staying on the porch, but with front feet as far in the living room as possible. The parrot cheers when they come home too and plays a wonderful game of peek-a-boo around a brown bag on the living room table. Everything organized and well cared for. The house pleasant up on the slope of Hualalai where it is cool and the sprinkles come in the afternoon, red plumerias and bouganvilleas bloom, tulip trees and everywhere one looks, flowers of some sort. A peaceful, ordered, clean haoli neighborhood, and close to the harbor.

They struggle for money, but just now they are in good shape. The program goes methodically and well. Jan has more than 200 animals catalogued and recognized, some on sight with the best of them. The new video has excellent definition and one can see scars and marks and sex. The viewing boat works well, but needs a new and higher bow. It is very well cared for. Chamber operation is clean and direct. Climbing up and down is for the agile but even I could do it. The windows are glorious. One forgets one is looking out through a port and instead one is in the blue world with the dolphins. The communication, by headphone, is excellent between the skipper and the observer. The blowers

work well, and seasickness is only a modest problem. I think I would soon become hardy to the motion, which is much less than either the SSSM or the MOC. So it's working well, and berthing seems to be working the Coast Guard slip.

Ania is the conceptualizer, Jan the methodical worker. He knows a great deal about terrestrial animal behavior and while I found him tough he is not frozen but instead thinking hard. So is Ania. Her data on the afternoon oscillation is coming along. She's trying to make sense of it all at once, just as I would do. Both are very bright, contentious, judgmental as graduate students (good ones) usually are.

So, I go home and write up a little piece for the *Geographic*. Good time.

Now to see Phylly and Sus and Fred. I buy leis and head for the plane. A long-delayed flight, and I'm on my way to San Francisco.

May 26, 1991

Massachusetts, Falmouth, above Woods Hole

Up this morning and down to the bus stop with Sus, at the Barn Theater. There I waited for the Airport Shuttle, which was late, and when it arrived it was seething with tension. An older lady motioned me to sit beside her and in the back a curious couple was grumbling incoherently. The man was a hunk, Mr. Universe I found out, a product of steroids for sure and a slimmer, taut, young woman, flax-colored hair pulled tightly back, breasts flat and sternum in view under a thin blouse.

He had left his ticket on the dresser of his motel and had erupted in a volcano of profanity that almost dislodged my seatmate, a nurse. The driver took us to the motel, not too far off line, the ticket was retrieved, and we shot like an arrow over the hill. Opposite Memorial Day traffic was building, but we arrived not too far from time. I checked in and made it to the gate on time and into the plain where I occupied a nice business-class seat and lay back a little to gather my wits. This trip is a hurried one. Woods Hole to see and interview Peter Tyack and see Dick and Teresa and Ben and thence to Stockholm to Mats's graduation, then to Houston-Galveston to interview Bernd Wursig about worldwide pollution issues and marine mammals.

Dick and Tre met me at Boston airport, and we drove together out to Falmouth where their very nice little house is located. It has a pond out front that connects with the sea at the other end and features various birds. I watched a cormorant catch and eat an eel, [?] swans flew in, huge and white.

The house is three bedrooms, with a tended lawn, rhododendrons bank against the garages, stacks of firewood inside the garage, trim and white in a controlled trim and white street amidst the mixed forest with a tight middle-class regulation about it. Not many overt smiles around from neighbors that I could see.

Down the block is Vineyard Sound and trickles of polluted water from the various ponds, shallow warm sea across eelgrass flats, and a winding string of summer-clad bicyclists or parties sitting on the beach.

Ben is walking now, the unsteady walk of a 1½ year old, huge smile, cranky from a molar coming in, words jelling out of the babble—his “more” is very clear now and other words that his parents discern, assembling out of the babble. The babble is a child's wordless mimic of adult speech I think and settles around commonest things, not all

norms by any means (witness “more”). Parents reinforce strongly for success and help shape words by repeating models to Ben. “More, Ben, more,” amidst reinforcing smiles. The clasp of parents is a haven, and I barely broach it, telgraphing my own uncertainty to him. He stiffens and soon slides into a wail, reaching out to his father with outstretched arms, fingers wide.

Dick and I visited his lab in Clark Hall. He works very hard and monastically, telling his iterative evolution story in the tests of forams stuck to SEM stubs and sprayed with metal dust for photographing. A [?] SEM-icroscope is across the hall where he can see his subject on a video screen and photograph it on polaroid.

His story fills in. he is carefully tracing the lives of his pelagic protozoans, then ontogeny (they have a complicated one, for a one-celled organism) telling a story of repeated [?] through the same trace, over millions [?], over and over again.

We barbecue on the lawn and watch the Canada geese troops come up little trails to the lawn where they clip off new grass. Mom and pop bracketing the troop of fledglings ahead and behind, heads erect and alert, launch and swim off in the same formation.

We put our feet up after dinner and talk of the difficult, competitive world of the soft-money scientist at a time when funds are drying up and a dearth of new positions are appearing. It’s tough and getting tougher, but Dick is making his way on sheer talent and drive. Teresa holds down the house and child, is full with the next one, due in July. Faced backward it may give her pain unless it can be rotated. We talk of names and family and go to bed.

May 28, 1991

Enroute, Stockholm, Sweden

This morning Dick and I find the new acoustic lab in an old Victorian just off Woods Hole docks. There Bill Watkins and company have set up their domain. Wat’s work has been to upgrade the lab and its collections. He has built two or more acoustic reduction labs, all digital and modern, doing at a stroke what I could never do myself—77T’s, etc. printouts in various formats, and down the hall a climate-controlled vault where the tapes are kept. I donated Gregory Bateson’s old tapes of the Whaler’s Cove spinner school experiment. I’ll transfer the library as fully as I can. This is where it belongs.

I interview Peter Tyack up in his office before lunch. We had such an exciting time that I got through one out of six questions. Peter sees very far, ties his work to other theory and both accepts the specialty of dolphins and rejects Lilly’s simplistic view. They are remarkable acoustic-social animals, but they emphatically are not people. He, like me, lodged this specialty in their sociality. He sees more uniqueness than I have—the whistle learning a use is a cultural system [??], he says is evidence of remarkable flexibility of mind. Primates, save most anthropoids, seem to have signals lodged in the genome—the cries of vervets about snakes and hawks may be there in isolation. I’m not sure this is primitive, though, only deep freezing a very useful pattern.

We have lunch at the Hole, a fine little nook on the bay with all the ships and the canal bridge into the Hole next door.

Then off I go with Dick and Tre for a last time. Dick takes me to the Falmouth bus. I sat next to Alexander Langmuir, an epidemiologist MD who had worked all over.

he told me many things about disease theories. He seemed peaceful and philosophical though less than pleased that he now had to weed his lawn. He is the nephew of Ernest Langmuir of Langmuir Cells and so much more—Nobel laureate.

I make the plane and out over the Atlantic in the dark—fields of white clouds hiding the water.

Beluga Adventures

Gulf of St. Lawrence

July 10-16, 1992

Resolute Bay, Canadian High Arctic

Cunningham Inlan, Somerset Island

Elwin Bay, Somerset Island

Cornwallis Island, Resolute Bay

July 29, 1992

Alaska: Anchorage-Fairbanks-Nome

September 8-19

Baffin Island-Iqaliut

September 20-23

Greenland

September 23-28

Edmonton-Resolute Bay-Cunningham
Inlet, Resolute Bay, Wadworth Point,
Creswell Bay, Northwest Territories,
Canada

July 16-Aug 13, 1993

Gulf of St. Lawrence

Note: These notes are different than my usual daily log. Here I attempt to record all things that will be useful in writing a magazine piece.

--Kenneth Norris

July 10, 1992

California, San Jose Airport

I wait for my flight to Newark and thence on to Quebec. There I will be met by Robert Michaud for a trip up to Ladoussac and other points on the north shore of the Gulf of St. Lawrence. This trip is the first stop on an exploration of the states of the North American and Greenland populations of the belukha or white whale, *Delphinapterus leucas* for a *National Geographic* story.

After St. Lawrence I head for Montreal and then a flight to Resolute Bay, up on Cornwallis Island, where I will meet Flip Micklin. We then meet Dr. Tom Smith the next day to helicopter down to his camp at Somerset Island, where he will attempt to satellite tag a belukha that is expected to make the traverse across Baffin Bay to the Greenland coast, probably to the area of Pisko Bay. We'll be there too, in late September, coming in from Frobisher Bay on Baffin Island to Muuk, the capital of Greenland, and Eric-the-Red's old housing development. It was he that gave the name "Greenland" I believe—to lure settlers to this seldom green, icy place.

I'm sleepy and ready to travel after a long gathering of clothing and supplies for this trip that takes me into a latitude I've never visited (75 degrees N. at Resolute), and hence with only secondhand ideas of how to prepare. Weather? Cold or hot? Will we have mattresses for the dome tent? Will the new gold-colored fly fit? Did I get the one that matches openings in the tent?

July 11, 1992

Quebec City, Quebec Province, Canada

I sit in the Holiday Inn restaurant after a good night's sleep, but no dinner, waiting to be picked up by Pierre Beland and taken up the Gulf of St. Lawrence to look at the situation of belukhas in this waterway.

It's muggy out. I don't know the temperature.

I'll visit L'Isle Aux Condres where the old belukha traps were, and then Ladoussac and thence up to Lac St. Jean where the two aluminum plants use hydropower to make beer cans, and which are purported to be partly responsible for the sickness of the belukha population. I'm told the reproductive potential of the belukhas is dropping.

Being dropped in the midst of a French-speaking populace and having little French, I'm impressed at how language is the ultimate definer of the tribe (amongst a good many others). Changes in the nuances of language define local moities and as they change so does language. One always knows the "in" group and whether one belongs or not. I watched a French-speaking group in the elevator, watched the responses of facial signals (smiles, frowns, uncertainties, signals of reception, and comprehension of the words)—all incomprehensible to me. All I could do was to smile in a low-key way to indicate I was benign but not of their language group. No wonder Quebec is separatist—

they are constantly reminded of the fact. The nuance of signal-response is their own and welds them together—the damn Anglos give all the wrong signals.

So it is with Jews, who have wandered most of their history among foreign tribes, with different sign systems—and always they have been foreigners in a foreign land.

Well, on to belukhas. I meet Dr. Pierre Beland here in a few moments, then off to change money and thence out the Gulf.

At this stage I'm a bit shocked, alerted to the fact that the juxtaposition of USA industrial culture spreads its toxins in a halo around its margins like a seeping sore, indicative of the problems within.

It goes both ways, too. The destruction of Canada's forests is more blatant than our own. Forestry is more economically central and hence its forces more powerful than our own—but we both manage to change, to deplete, to destroy.

July 11, 1992

Canada, Quebec, Tadoussac

After breakfast this morning, Dr. Pierre Beland, director of the St. Lawrence National Institute of Ecotoxicology, a private nonprofit institute devoted heavily to ceteacean studies, picked me up at the hotel and after abortive attempts to change my money (it is Saturday)—Pierre says “no need, everyone takes dollars”—we drove off down the coast of Gulf of St. Lawrence toward the [?] where there used to be pole traps for belugas. They use “beluga” here, and “beluhkha” in Alaska, according to Pierre.

He is a compact, energetic, very smart, synthetic, outspoken guy of drive and imagination. He has a background in biology, paleontology (dinosaurs), qualitative biology, and belugas. He was raised here and has been all over the world on one project or another. His work ranges from studies of the Gulf of St. Lawrence belugas to using albatrosses to sample ocean pollutants. His team works widely on the whales of the Gulf and the sources of toxics. If he needs a method he gets it and uses it.

One problem he told me about was the high incidence of a toxic called mirex in beluga fat, used to control fire ants in the south but made in a Magra[?] River plant. It has higher concentrations in eels of the Great Lakes but belugas aren't known to eat eels to any extent. He thinks they must, because they are the major source migrating by. He checked and such information as there is on beluga feeding was all taken at seasons when eels were not migrating—so he lays in wait for a dead beluga during the proper season.

Robert Michand is an MA from the Quebec area who has had much to do with counting belugas and with setting up the whale-watching program and facility at Tadoussac.

Robert's lady is Jamie, who works on blue whale IDs and group size.

Richard Sears is way out at the end of the road working on large whales.

Pierre told me all the problems of running a private non-profit research institute—déjà vu—so much was the same as Oceanic Institute, except that they seemed to have kept good financial control.

L'Ile Aux Conodres is a largely shale and granite island—23 miles long—a hogback . . .

July 12, 1992

Canada, Quebec, Tadoussac

Up this morning before the hotel breakfast and down to the car and thence to the boulangerie for a cup of coffee and a sweet roll and thence off down the shore toward the

dock of their vessel, the *Bleuvert*, named for the gray young of the belukha. The harbor is a little man-made nook that holds maybe 40-60 vessels and has a little restaurant and a repair facility.

The vessel, made in Iceland, has a hull like the *Nai'a* (25 ft. fiberglass) but with a larger enclosed cabin, very suitable to the weather. The captain has a nice control panel and can stand up with his head through a hatch when tracking animals or docking. It has a head and a bit of a galley, a volvo diesel (very nice), and a through-hull propeller.

The day was absolutely flat calm—only the peaked water of tide rips marked a flow, in some places up to 7 kts at times. Robert was to do photo ID—he has managed perhaps 100 already even though his animals have no dorsal fins to speak of, just a ridge.

We set out on a pattern of stops at places where the belugas were known to congregate four or five in all for the day. The places in between are apparently all but vacant of animals.

Captain Daniel LeLevre piloted. He is a big, tanned man of 35 or so, VP of the St. Lawrence National Institute of Ecotoxicology, which is the home of a few young entrepreneurs in science looking for a way past the system. They do pretty well, I think. No. 1, I think they are technically sound, though this is not to say that they aren't also opportunistic. Richard Sears is their big whale man and he is way out at the end of the north shore miles and miles away.

Robert Michaud is the ID man on belugas and one of the forces behind the new whale center at Tadoussac. He worked at whale watching for a while. His lady friend is named Jamie and she works on blue whales. Pierre is president and lives in Montreal, working from his home there. He is either separated or divorced and has two children. His self-possessed, 15-year-old girl, Martin is with us. She takes the world's measure.

I asked Pierre about how they ran the finances of his institute. It's fairly simple. Half of a grant goes to the institute to do a project and half runs the PI and his direct expenses. They have a bookkeeper and are audited. When they run out on a project, no pay. So they live from project to project. But they do [?] and they maintain much independence. They are a force in interpreting what is happening to belugas and the whales.

The beluga population apparently has dropped dramatically, judging from early records of the beluga fishery here when ____ animals over ____ years were taken. Now, an estimated 469 +/- 5% remain. It is a question whether or not they are declining further. Pierre will look at the proportion of young, a figure independent of the total population, to find out.

He investigates pollution effects from the once damned aluminum plants above Chicoutimi on the Saguenay River—I say “once damned” because it is now thought that they can only be part of the problem.

Food from belugas taken locally and bottom samples show low levels of pollutants from the Great Lakes upstream. Yet the whales have very high loads of some chemicals in the blubber; mirex (a chemical used in the south to control fire ants), PCBs, mercury, DDT, etc. How come? Maybe it's the food chain? Maybe the eels, *Argulla*, migrating to the Sargasso Sea. They carry those chemicals including mirex. Eels have not been implicated as a major a major part of belukha food. In fact they've only been recorded occasionally. But such samples have been at the wrong season for eels, which just pass through. So he suspects but doesn't know.

After the long day's run, bread and cheese on board, a snooze in the cuddy cabin, back to the aging elegance of the Hotel Tadoussac—a huge old place all shiny red roof,

widow's walks, gleaming white siding, croquet courts, and then the beach and modest rooms above, with little dormer windows and motel art, wagonwheel lamps, and blond furniture. Tasteless sprawl and a touch of the past.

Tomorrow Chicoutimi to look at the aluminum plants, and a creek where some say belukhas swim to give birth. Pierre says, "Poppycok." No evidence. But in places white whales go into rivers—why? Food? Temperature? To slough skin? Why?

Here are notes from on the channel.

A dozen belugas (Canadian spelling) including young stages including the bleuvet and all the way up to pure white animals, and the stage one size smaller that looks like dirty linen. Absolutely flat. Animals are evident all around us.

Robert Michaud is busy photo ID'ing from top of cabin. He uses a 300-mm lens on a camera mounted on a shoulder harness normally used for a TV camera. It leaves his hands free to take notes.

Traffic plying back and forth in the deep channel where the belugas go.

They seldom throw their flukes. They come up and the tail bends and they go down.

The head pushes a bow wave that looks like a black "bone in the teeth."

Animals moving very slowly—1.5 knots—even though they are 40-50 yards apart, they obviously are in communication.

It is a greenish coppery [?] day (is it my new dark glasses?).

The St. Lawrence runs in a fault channel in the Laurentian plateau—the ancient granite 1.5 billion years old covered with on order of 10,000 feet of ice, says Pierre. Sounds excessive to me.

There are animals with obvious pockmarks in their sides—used for ID. Are they lamprey scars? We've seen lamprey hanging on. Indentations.

Identifying these animals is an order of magnitude more difficult than most dolphins, except age is clearly marked by color stages.

Robert says he saw a herd of about 35 animals in about a 500 m radius.

He says 15-18 subherds, one calf and at least 5-7 grays of various stages.

In summer Robert says there is a fairly strict geographic separation of age classes. How separate are the sexes?

Robert says herd size varies with position in the channel. Downstream it is small herd size. Here (off Cape Angle) age classes are also segregated in Gulf and estuary. They separate the two, the gulf is out to sea farther. This is estuary at Tadoussac.

Robert: Animals that we are seeing here are never seen downstream. We have animals that are so obvious they are sighted 10, 12, 15 times, downstream 50 km from Tadoussac. The obvious and well known animals have never been seen here in last ten years in summer. On the other hand I have six matches from here and downstream and of those five grays—juveniles. I think there is a strong site fidelity. The males are in the downstream area. They are typically in herds of up to 150 animals radius 500 m to 1 km. Tight formation, up to 16 [?] up to hours and hours.

Ken: When do they mate?

Robert: We don't know. If there is a peak in calving we figure that mating will occur in early spring.

Ken: A bit brisk?

Robert: Yes, quite windy. I've done six aerial surveys and most sightings were at ice edge in the Gulf. In this time they are out in the Gulf, out of Sagenay and I'le Aux Condres. It's about half the size of the summer range.

K: Including males?

R: All animals. I know that the whales are there but I have never made observations.

K: It sounds like the time they should be mating.

R: It might be. They could be mating in March-April. It's still something that is unclear.

K: Like my story, after 25 years it's still full of holes. God, it's slow.

R: This summer we're putting all that we know about these patterns together and from there we will look at other things.

K: For a degree?

R: Yes, after that a doctorate.

K: Are you publishing?

R: No, not yet. I've published agency reports and [?] three papers.

K: What do you folks think about the fate of these animals? Are they in trouble?

R: From Pierre's work they seem to be in trouble. If there have been only 500 animals for the last 25 years something is happening to the whales down the line.

K: You mean because the numbers are not increasing?

R: Yes.

K: Why do you want them to increase?

R: From all the numbers there seems to be a fairly stable population. We have only found the carcass of one known whale.

K: Gee, that's surprising.

R: Yes, the ratio of known to dead whales.

K: Does that make you suspect your numbers?

R: It raises a question. (A long discussion of what they're seeing about percentage of calves. I think it means they are uncertain about the percentage.) Except this season when we see a number of new calves.

K: How long through gray stage?

R: Six to eight years old they will be all white. Some animals are white at five years and some are gray at ten. Six to eight coincides pretty well with sexual maturity.

K: Well they are pretty marvelous and what a day! You can hardly beat this.

Robert will stick around 1-1½ hr with a group like we just left and then try to find other animals. We had a nice lunch on the afterdeck sucking up our juice and eating our french bread and cheese. It's absolutely glassy calm. The water is greenish and the sky partly overcast with the sun coming in. It is in fact as close to glass as you can come. We can see whales a very long way.

The adults that come up are immaculate white. You can see the low ridge of a fin on their back and then the muscular tail that bulges through the blubber layer. As I said before, very seldom do they throw their flukes. I recall one that did.

A little fin of rock with a low scrub of trees on top (Grand Ile).

R: See the tower on top? We use it for observations.

We see a single beluga. Robert tells me it is where that one belongs, at the end of the island. Robert says the island is great for berries.

I was asking Pierre about the structure of his organization. He's the President and Daniel is the Vice President, whom he describes as a guy who can do anything, very practical and sharp but untrained.

Richard Sears is Secretary, I think, and then I forget Robert's position. They pay for all their own supplies out of grants.

Tight fiscal control. Somebody's pretty smart. I suspect that it's Pierre. If he consults he charges \$600/day and he keeps \$300.

A black guillemot just flew by. A fast wingbeat with white wing specula. Robert says feet and mouth are bright red.

A widespread group of belugas being lazily circled by birds—just a few. I haven't seen a bird get anything to eat. Once I saw the birds settle around a beluga and I saw one of the latter with its head plastered with greenish mud. Three belugas plastered with greenish mud, on their heads and down sides of body.

In the Saguenay the bar gets up to 11 m while upstream it drops to 270 m. A terminal moraine defines deep channel end from the Gulf. This defines where belugas feed. Upwelling and high productivity.

They can predict where the belugas can be found. Larger areas are untenanted.

We move back into the harbor now that the day is over.

The days are very long here. The sun sets at 9:00.

The St. Lawrence Institute is a repository for projects. You put one in and then you get paid. No money, no pay. So they don't go in arears. For example, Daniel is on a project now so he doesn't get paid.

July 13, 1992

Canada, Quebec, Tadoussac

I take off with Pierre and Martin to Chicoutimi and Joniquier where the aluminum plants are, St. ____ du Nord about halfway up. A beautiful channel 200 m deep with ancient sea water at bottom that creeps over the bar at the terminal moraine.

It's a little village of white and red houses tucked up against the forests and rocky bluffs. The tide line is way up the cliff. There are a few little yatches at anchor. The water is like the Rio Negro—a bad grade of tea—and a considerable freshwater layer at the surface.

Pierre says this is a remnant of when the Laurentian ice sheet was south in this area. There is a fauna of Arctic cod and sleeper sharks still here. These animals have been left behind along with the beluga.

One [?] wonder that these belugas can stand fresh water when in fact over the surface of many of the estuaries they live in is a layer of fresh water—so they spend a lot of time in fresh water. Prehistorically that is the norm. The fact they can stand fresh water and most of the dolphins can't isn't so surprising. The fact that they may run up river may have little to do with fresh water.

Churchill River

Summer belugas, Pierre says, should be fatter so buoyancy supports them in fresh water.

He thinks buoyancy is why they are fat. He says fat percentage remains fairly constant even if body shape and size may vary. They must be trimmed to neutral buoyancy first and foremost or the cost of swimming will be too high.

Pierre: We allow the use of DDT because the experiments didn't show its use was dangerous. But if we had done it the other way, wanting people to prove it was not dangerous . . . the burden of proof.

K: I'll find it.

P: You can reject the [?] hypothesis or accept it.

P: When I'm writing I'm a different person. I'm in a different world. I get very bright. I think and then I write it down. People read what you have written and they come to you: "You are brilliant. What do you think of this?" But the brightness is gone. I'm sorry the light is off.

K: How familiar. It's what happens at 4 AM.

P: That's what people call inspiration. Some people have to take drugs. I don't have to do that. These moments of creativity are more important than anything else.

An artist doesn't subject his work to falsification. A scientist has the same idea and comes up with an idea and then says to other "destroy it, please." If you can I'd go to something else. If you cannot, I've found it.

K: Elegant.

P: A scientist should love criticism. If they hide data and evade it, I'm sorry they're not scientists.

K: Right. They're technicians.

We reach the uppermost reach of belugas in the Saguenay.

P: Every year we see a couple up here.

K: They're mostly in the entrance area.

P: Yes, first five miles.

These little towns we've come to. The hills are lower and the canal is shallower, . A lot of oil tanks, industries, 80,000 people. Pierre says. Birches more than conifers, alders, willows, here on hilltops. Gray or jack pines here, Pierre says. Larches, tamarack.

P: Mostly its deciduous conifer. I was a diver once. I'd get hot. You have to stop. If belugas swam fast they would just melt. (I mention Carleton Ray's walrus stuff.)

We're in Chicoutini—

Were going through suburbs of little neat houses with tricycles on the lawns and beds of flowers and patches of green lawn.

Pierre says maybe a mile of ice here at the peak of glaciation. Speaks of elastic rebound of land. Isostasy. Edge of ice was here 11,000 years ago and this was equivalent to Ellesmere Island in the Arctic today.

P: Some remained here. Water is very cold here. In the winter it's the Arctic. It's just that we have warmer summers. It gets down to 40 below.

What keeps this Gulf of St. Lawrence so cold is that process of winter. Winter. Water is densest at 4 degrees. During the winter it cools to zero degrees and when it warms up it sinks.

K: Hey the red paint salesman has been here. That big red roof.

P: I think this may be the biggest aluminum producing complex in the world.

We're at the old Alcan aluminum plant. There are four lines of high tension towers leading in a big condenser-transformer. We're going up on the road in back of the plant.

On a promontory to look over plant. Bushwacking. Whole row of railroad lines down the center—on order of 100 stacks. Trailer housing. Refractory stacks, brown smoke, protective fencing. What is main contribution to local environment?

P: Benzo-a-pyrene, a polycyclic aromatic hydrocarbon produced at high temperatures in forest fires, cigarettes, and aluminum plants. [?] electrolytic process with two electrodes and a bath of aluminum current burns electrodes and builds of Al^{++} on other and this releases benzo-a-pyrene—one of the most potent carcinogens known.

It used to be poured into the Saguenay in liquid form and later it was released mostly in stack gas or smoke.

An experiment was done measuring benzo-a-pyrene in mussels and it was found concentrated in direct relation to Aluminum plant. Mussels at the Gaspé had only the background level. The closer to Saguenay the more benzo-a-pyrene the closer to the plant. They transplanted mussels to mouth of Saguenay and in no time at all they accumulated very high levels of benzo-a-pyrene.

We found benzo-a-pyrene adducts in the beluga whale—metabolic degradation products. Some metabolites will hook up with your DNA—that's what we call an adduct. Chemically bonded to DNA. There's good argument now that relates the adduction of foreign compounds to DNA with increased and eventual promotion and induction of cancers.

We are finding in our whales a very high rate of cancer. I think there in the whales of the world there have been described something like 10 cancers, and we have eight of them.

K: Does that mean 20 kinds of cancer?

P: Different kinds. Among all the tumor found in whales of the world, half of them come from beluga whales. We have autopsied about 40 belugas and we have found about half of the cancers known from all marine mammals comes from our population. So there is something happening.

Benzo-a-pyrene seems not to be the only agent, because if it were, we would presumably find a syndrome—a single kind of cancer—but we don't.

What's coming from upstream are other compounds than this one. The other compounds are probably affecting the immune system of the whale. When your immune system is affected you may be susceptible to certain types of cancer if promoted by the substance (benzo-a-pyrene). A very complicated picture.

Why this has become the [?] of problems of the beluga is because in 1985 the first cancer we described was a bladder cancer. This industry is linked to a very high level of bladder cancer among its workers.

We said "aha"—our beluga lives just downstream of the plant and bladder cancers are rare in animals and unknown in wild animals. This region here has the highest rate of cancers in Quebec. So that's the link. So we cannot prove that the cancers we have observed come from benzo-a-pyrene, or that the benzo-a-pyrene we observe comes from this plant.

We can say that in this area there is a very high level of benzo-a-pyrene in the environment, higher than anywhere else in Quebec, and that it comes from this plant.

You find it also in cooking plants, any place where burning of carbon goes on at high temperatures. Or in a smoke-filled room.

K: Right.

We're looking at these stacks across the width of these plants. Stack gas is brownish. Other stacks exhaust steam.

P: The biggest stacks are where the electrolytic process, the Soderberg process, is going on. Named after a Swedish engineer. It's not used any more. The new plant north of here uses a new, cleaner process with very little benzo-a-pyrene products.

K: So the company itself has developed a new process but they are still using the old plant.

P: Yes, when they advertised it, it put a lot of pressure on them. When we started advertising beluga problems they announced that they were opening a new plant and that as this plant was getting into operation then they would close down one of those stack units at the same rate as they were opening new capacity, but as you can see most of these stacks are still running.

K: There's one that doesn't seem to be doing anything at the moment. It looks like repairs are going on around it.

P: In my view they should all be closed. This company in 1989, its profit after taxes was 1 billion U.S. dollars. So you can imagine. These guys have much more power than I have.

When they are discussing with the government and who can do what and whether they are having an affect, these people can put five million dollars in publicity and public relations tomorrow morning to demonstrate with all sorts of experts and data that belugas are not linked to this plant. I cannot muster that amount of money.

K: (laughter)

P: They eventually win.

K: I'm not so sure.

P: I'm not so sure either. Eventually they will lose. I told them four years ago. Robert and I went with some of the big bosses in Montreal and we told them what they should do is associate with one institute. They should give us millions of dollars a year for proper research and correct their problems and be open about it and say, "We're not controlling this institute. We're giving them money to do the job and in ten years we will solve the problem." They didn't do it of course. They have a lot of problems with the public now. Everyone is on their back.

K: Times are a-changin', Pierre. It's amazing to me the strength of a person like yourself in a situation like this. [?] People that get their facts together. It's not the ones that just shout, it's the ones that honest to god know what they are talking about. There is a David and Goliath thing going on there. Also there is a generational change going on. The old generation is going, and it's because of guys like you.

P: I've learned over the years that within this company there are hawks and doves. There's a group of people in that company that believe that there is a problem and are trying to do something. But, they haven't won. They gave a Tadoussac Conference on belukhas. The doors were closed. The old guard was . . .

K: Behind those doors what is happening is ferment and it takes a little while for the ferment to replace those old values. The old values don't go easily. You wish it would hurry up.

P: I don't know what happens but there is fluorine released here (we pass a fluorine plant here).

He tells me about etched windows in Jonquievre.

P: The cows eat the grass and get fluorosis. Affects teeth and bones. They hired a vet whose job it was to travel the countryside looking for cows with fluorine effects and to buy them. They would kill the cows. Our beluga have teeth problems and bone problems but it may be an immune system thing, or it could be due to fluorine. I don't know what happens to it.

(We're now in back.) Those are ore cars coming in, rust-red with bauxite. There is a spoil pile back there abuzz with skiploaders. The ones come in by ship to a port on Saguenay. (An absolutely huge plant. We're driving around it now. There are hopper cars. The fluoride plant is in back. Reynolds aluminum is Baie Comeau.)

The plants in Mohawk Reservation, New York have produced fluoride problems in cows.

(We're back in Skitch Yard. We're still driving around. Piles of carbonaceous material. A tube plant.)

K: Tell me about old population of beluga. Randall Reeves and Ed Mitchell's calculation to turn of century. There were years of kill with 700 animals killed (almost 2X present population).

P: Derived from skins and barrels of oil a population of 5,000 animals. The standing stock was 5,000 and they were taking about 500/year and the stock was dwindling.

(Now passing industrial research section and Centre Analytique. We turn around in a guarded gate.)

P: I think Reeves and Mitchell used too high a rate of natural increase in their paper. There may have been 2X as many animals as they projected. It was not sustainable.

(We are going down road to La Terriere toward new plant. Not a forest of stacks, 15 instead of about 100. Blue and aluminum. Smaller but also power lines going in as a single one instead of four—probably smaller.

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July 14, 1992

Canada, Quebec, Tadoussac

I spent the day at the Hotel Tadoussac transcribing notes from the tape recorder. I took a walk at noon, out on the dock for a lousy hamburger and ossified french fries and then headed back for the room, past the oldest church in North America (1603?), which is right to the side of the hotel and by the water. Its cemetery has a lot of old, thin marble gravestones, but none of them seem very old. I don't remember a 1700s one. Then back to work.

In the evening we drove out to Robert and Jamie's place out along the north shore. A neat little house in the birches at the water's edge. One could look out over the tidal flat to the drop-off into the deep channel and there they had been seeing a sperm whale today and for a matter of weeks—diving for 40 minutes or so, and then surfacing—alone.

We saw a minke and saw Jamie coming in high-speed by Zodiac from her work with blue whales. She had followed one today. She is an MD who now works only part time to survive and chases whales the rest. She is Robert's friend-in-residence—a hard-driving, almost obsessed person from outward appearances, though that may be superficial—pleasant, harried looking.

Robert is a compact, muscular man, once on the Canadian downhill ski team, but he tore up his knee. He works very hard, fine-grain stuff, methodical, usually late, a skeptic, and not one to draw the broad conclusion—like Randy. Honorable, straightforward. I like him and Jamie too.

I talked to the group at the new interpretive center at Tadoussac—a very nice facility full of whale stuff, T-shirts, auditorium, offices above where Robert perches, right on the water. My talk on the history of studying whales and dolphins went very well. A good group (35 interpreters).

July 15, 1992

Hilton Hotel

We drive in—Pierre, Martin, and I. Five to six hours through the Quebec countryside talking of this and that. It's hard to realize Martin is 15; a little girl, really, but self-possessed and making her own way, very much in love with her "papa," interested in religious history—just budding, fine luminous face.

We met Pierre's new lady, Maria, a pretty, blonde, blue-eyed, slim lady who works in TV, kinetic, swags bugs (no fieldperson is my guess). In the newsroom doing soundbites, two minutes, four minutes. We had an Afghani meal (interesting) and Pierre took me to the airport where I am now at the Hilton catching up. Tomorrow morning I head for Resolute Bay where the high today was 2 degrees F. Sounds brisk. I wonder if my rig is warm enough, but how does one haul all this stuff? Maybe I'll rent it at Resolute.

July 16, 1992

Montreal

I spent the day at the airport hotel with a brief trip out to buy a good field coat. I got a double one.

Then back at the hotel, watching the Democratic Convention, I began to develop a belly ache, then diarrhea, and I feared for dysentery, called the hotel security, got nowhere. Paramedics couldn't prescribe anything, and I wasn't sure I could take it anyway. But gradually Pepto Bismol slowed things, and I warily lay back, hoping for the best. It's better now, though iffy.

I was impressed by the hope in the Clinton-Gore message. We'll see.

July 17, 1992

Enroute, Resolute Bay, Cornwallis Island, Canadian Arctic

I sit at the Montreal airport, a kind of pre-drizzle in the sky and the plane (Canada North) is being loaded to take us to Resolute. We will stop at Frobisher Bay, Baffin

Island, first, and I may change planes though my ticket doesn't indicate it. My belly ache is settled down to a sort of internal unease, as if I better watch it carefully.

The passengers include only one identifiable Eskimo—or Inuit—long-haired [?]-writing a crossword puzzle, most look like they have business or live there in some capacity.

We lift off. The cabin is at least half cargo, in front of a white wall, with us behind. We've been told about exits, life jackets, oxygen, and the like, and I sit with a mom and her lively 2½ year old (Emma) enroute to Resolute Bay. Her husband helps to maintain the airfield and its support. The land fades in the mist, flickers into view and disappears in a blanket of white. We're above it now, enroute to Kaliut (Frobisher Bay). I doze—what's ahead?

We fly over N. Quebec and out over Baffin Island. It's a low, creased land of tundra-covered hills, long, partially frozen lakes, sounds dotted with ice floes and skim ice and open water. The snow lines ridges with white tufts and defines the shape of the land. I look at the Frobisher Bay newspaper—half Inuit and half English, like no other language I've seen. Something an anthropologist invented. There is a three-bedroom house (small) for \$129,000. They have trouble hiring J.P.s (justices of the peace). The pay is too low and Inuits don't judge each other—only tribunals do. They have a loose sled-dog problem. One man says it's simple—the owner pitches a tent with the dogs and lives there. Don't tease them or they turn mean. There is a narcotics anonymous program and a home violence counselor, and Arctic char, which take decades to grow up get scarce in the Sylvia [?]. Another talks of a char derby and for the winners are three gutted fish weighing 50 lbs. Jobs are open for someone to write a curriculum, but must be fluent in English and Inuktitut for grades 10, 11, 12. . . .

We come in at Iqaliut (Frobisher Bay). The plane sets down on a long, cement runway patched with a webwork of tar lines—I suppose the result of winter cold. We roll up alongside a bright yellow-orange terminal building on cement legs above the permafrost. It's of metal with vestibules. Inside are the counters of local flying services—a service to Nuuk, Greenland (twice a week), a tourist counter, and a little food nook. We spend our 25 minutes, move back out into the crisp but not cold air, nearly overcast sky. The landscape is rounded.

Two hours and 15 minutes to Resolute, at 31,000 ft., up into the overcast again and into the bright light.

Baffin, larger than Texas, has 10,000 people, 3,000 of them in Iqaliut. The rest are in little camps around the margins of the great island—Pont Inlet, Arctic Bay. It doesn't make any difference to this plane if it goes to Resolute except when it lands.

Out over the pack ice we fly—a landscape choked with ice and due to the whims of currents and eddies and patches of open water or [?], far below. Islands now, a dark landscape of sedge and frozen lakes, of permafrost and polygonal ground and of rounded outcrops of rock smoothed by the now-gone ice caps, I'd guess, though due to lack of precipitation some of the Arctic remained iceless. I don't know.

The steward just provided me with a window just as Somerset Island passes to the left 31,000 ft. below. The ice is drifting in great polygonal slabs that somehow retain [?] linearity although miles across.

We passed inland from the coast—bluffed, bare, and eroded. A dark glacier dumps into a jade bay. The land is low and rounded streaked with snow where the wind has dropped it. An almost black glacial river choked with sediment winds its way across the smoothed landscape. More snow now, but still ¾ dark buff rock. The drainages aren't

as obviously dendritic as some lower on the planet but they do branch. Now a shore choked with ice and its river with long cracks—not maps of Iowa or polygons, but the cracks of larger-scale rotations against the shore, pieces 20 acres in extent rolling like plates on the surface sea, their edges battered and fractured. The ice surface is mottled black and white. The white are drifts of windblown snow, I think and like barchans vaguely crescentic. It's more like tectonic plates and rotational forces of the crust.

I may see bowheads and belugas (no, too high). Now the ice blocks are a pale lucent gray-blue with snow patches.

The high Arctic! We drop down to Resolute. I think I may see clusters of belugas in one place. The continuous sun. It's bright out.

As far as one can see—ice polygons until they disappear under the clouds. Bright white and dark ultramarine water. Ahead the olive gray land, the heaped clouds like puffs of wool cast on the shearing deck. Now the snow-streaked bluffs. Cornwallis is low and planed down here. Now the sea beyond the land shining in the constant sun. A tan pyramid 1,000 ft. high sweeps under the wing, largely clear of snow. The sea bottom jade green, a longitudinal pool of red, like blood, just back of the beach. Was it?

We land over hummocky ground. Rectangular houses—on a gravel runway in a cloud of dust, metal building, tan red, green, power lines, drums of fuel, blast fences, trucks with lights on the roof. Quonsets, oil tanks.

We head for the Narwhal after Flip meets me. He seems a bit preoccupied. Lisa of the Film Division at *National Geographic* is with him.

The Narwhal is a trailer house writ very large. Pool table, dining, 50 rooms maybe. You enter and leave your boots in the vestibule. Down the street half a block is the store. I picked up a pair of wind pants. It's sunny out but with a little breeze. It cuts like a knife. Subtropical beasts like me feel it even under these best of conditions. Flip's had wind and snow and has one roll of good underwater stuff so far. He's been here since mid-June. Tough going.

I may take a snooze. Lisa is out for a run. It's comfortable. Resolute's not much but I'll take it. Flip says they located it here because this is as far as the supply ship could get—windy, bleak. We are in the company town part, and down the road is the scruffy village. Arctic Bay is better, Flip says.

But, I'm here, and it's the Arctic, and tomorrow Tom Smith's group comes here and we learn the next detail.

Somerset Island is to the south. I'm reluctant to go out and wander around without supervision so I'll wait, and besides it's a bit brisk and I don't much want to have my cold-weather rig out just yet. I called home and talked to Phylly and Fred and all's well.

I talked to a young German computer scientist and he had walked inland six hours and had come upon many flowers and had no sightings of bears, which he says cluster on the shoreline.

I'll sign off now and go to my room for a bit of rest. The curtains look like they can close out most light even at 9:45 PM, which is what it is, and its bright sunlight.

July 18, 1992

Canada, Cornwallis Island, 75 degrees N.

What a day! The Arctic creeps in as I begin to understand it a little.

It's remote up here, a frontier with very little ancient human presence, even from Inuits. Most of them have been brought in or have followed the imperatives of the nation

who controls this austere land. Most has to do with geopolitics and potential resources—flying the flag.

North of us on Ellesmere is Eureka, a weather station, or Grise Fjord, another new community. Resolute and the native village down the road are new, constructed here because sea access for large ships and a field for planes to land. The DEW line has closed down and Canada has its own for Cruise missiles. The story is most of the junk remains, bulldozers, oil drums, etc. or has been pushed into the bay, or through the ice.

The real native villages and life are to the south. So what's the land like? I took a walk up to the top of the nearby hill—perhaps 100 [?] high, part of a long, rounded bluff that defines the land of the village of Resolute. I went with Peter Banta, a New Jersey lawyer whom I met at the Narwhal. He's a real nature buff and an interesting guy. He's been before the supreme court.

We walked across the end of the gravel field—a field piled and graded on top of the permafrost, perhaps 10 ft. deep. On each island is polygonal ground, puffy in the center with clay and lichen-moss cover and of frost-shattered rock defining the polygons and lower. So as thawing occurs the water runs around the webwork of polygons, carrying away the dustlike cross of ice degradation of the rock. As I see it, the freezing squeezes the rocky soil onto polygonal shapes and lifts the central soil, thus grinding the water around the periphery and washing away the flour. The flour, by the way, in my view, is far from being mostly produced by glacial ice grinding. I think there is a powdering off process here by thawing and freezing in homogeneous rock.

The boggy places are really boggy. The moss mats sink and squish under your feet. Many flowers were about but only of a few kinds. One looked like a magenta gentian, a pincushion (*Saxifraga*) of purple horns like a Victrola, a little yellow *Draba*, and what I took for a pasque flower (Arctic poppy). Hairy stems with glands, pale-yellow corolla, many stamens. There were cushions of grass—very low, little green more than five in. high, some lichens but more exposed soil and fractured rock. I'd expected a sedge cover but it wasn't there.

We scrambled up the shingle and finally stood on the rounded top and could look around. A bench mark was there and a rectangular rock cairn seven ft. high with a weathered wooden ladder to the top. I expect it was used by surveyors.

We looked around—low hills eroded and marked by white snow streaks and fractured rock. Here and there are cushions of flowers bravely showing off in the cutting wind down close to freezing. I did not have gloves and Peter lent me his windproof mittens, while he kept the mittens themselves. I was glad for my dark sunglasses that stop UV, even though my disparate eyes take a while to adjust so I don't blink in the bright sun. Gratefully, after half an hour or so they did adjust enough so I could see well.

From the hilltop the landscape is simple, austere, beautiful, and a little threatening though now bathed in 24 hours of sunlight. Resolute is tiny—the airport and a cluster of buildings, vehicles, a whole farm of oil drums—very utilitarian and very tiny in the landscape.

Fields of ice flow to the east in the channel, dark indigo water to the west, scudding low clouds, pale arctic light, one feels the heat on one's skin.

The plane comes into the terminal—a 35-ft. room with two shops, a baggage rack, free coffee pot, and control.

Tom Smith, weatherbeaten, taciturn, tough field man and his crew arrive and we pick up their battered gear, including a satellite tag. Fisheries and Oceans, like some of our field people NMFS. They know how to do their own thing, and I feel lucky to be

included. Tomorrow we may make the helicopter crossing to Cunningham Inlet. I talk to a couple of fine Saskatchewan wheat farmers up to look at the Arctic. Robert and Blair Anderson from Swift Current.

9:25 PM and it's as light as noon.

Tom tells me they catch the belugas when they work their way into the shallows at highest tide and may strand. They can be netted and then give little trouble. Some thought that they may be feeding in the shallows where food has become rich under the ice and then push it as edge feeding. Smith says they seldom are taken by bears. The bears are too scattered to matter much, but he does remember when eight died. The last satellite tag lasted, I think, 52 days, and the whale went out south of Ellesmere on a course to Greenland. We'll see what happens.

July 19, 1992

Resolute Bay

Hurry up and wait. The fog at Cunningham Inlet got us and we'll try again after noon. We aroused ourselves at 6 AM, packed, had breakfast, loaded duffels into a pickup, which reappeared at the Polar Shelf warehouse where various research efforts are staged out of it. There are two floors of Skidoos (snowmobiles), tents, cannisters, etc.—all the support of field science to be placed by helicopter or Twin Otter.

So, we're back at the Narwhal watching a golf tournament in Scotland. I write a little.

This morning we looked out the window of the Narwhal and out by the runway was a great white rabbit, at least as big as a cocker spaniel—hopping along, sitting up, nibbling—an Arctic hare. Pure white so far as I could tell.

This town is unlovely—a cluster of utilitarian boxes in which people and their stuff can be found. No amount of colored paint seems capable of making it fit in with the wild scene around us. The pack ice flowing in and out between the low, snow-flecked islands.

There are creature comforts—lots of good food, fuel, communication, and I suppose medical attention. But we have to get out of here to experience the place. I wonder will my clothes work

Smith is a wiry, ginger-haired man, lined face from much time in the Arctic—softspoken, self-deprecating. He says he has to have these big camps now because he is getting forgetful and has to stay in one place instead of doing new things all the time, because all the stuff he would forget is already here.

He'll probably move from Cunningham Inlet, where his tower is up, to a smaller estuary on the east shore—Elwin Bay.

A golf tournament on TV (British Open, Nick Faldo winds), lunch, and the word comes that we can go. Lisa, Flip, and I board a Kinn Borez airlines Twin Otter and sit in a row of seats with a row of drums: "Shell Jet B with anti-icing additive" smelling dully. It's bright out now.

Tom Smith says somebody added a zero to their orders for flour and vinegar. We have 200 kg of flour and some gallons of vinegar. I imagine a giant loaf of bread with all ten of us burrowing out from inside, brandishing vinegar bottles to drive off the polar bears.

We left off quickly as Otters do. We have big squishy tires which I suspect are good for rough terrain landings. We circle and head south. Cunningham is almost across Barrow Strait, Peary Channel.

The brown, barren land plays past below us streaked with rotting snow. We hit the ridge of the channel, banded with white ice. The sea is dark greenish blue, deep, apparently lacking transparency.

The ice is alive and an integral part of life up here. It opens, closes, blocks, and fills bays or locks them tight and when it leaves the life accumulated below it becomes available. Perhaps that is what belukhas seek in the shallows and the high-tide strand and find it worth it to strand occasionally even if the occasional polar bear may find a beluga now and then.

Flat, polygonal blocks of ice, snow-covered, and pure white scatter the sound. [?] near the opposite shore where much of the ice has docked. It's a blue and white world streaked with a low-lying deck of gray fog. How far to the shore? When will it open? When will belugas come?

We begin our descent from the bright sun. It's all gray.

The cloud deck reflects the colors below it. Gray for water, white for sea ice, so you can learn it, read it like reading turquoise atoll water under the tropical clouds.

We drop in. I can see our plane's silhouette on the cloud's below, ringed in rainbow light. We pass over a flow now, dark water, and gray clouds. Now the ice is pale blue green and white flecks—snow patched scattered like barchan dunes across it over slick sea ice. We come in low over a point of tidal mud—no it's dark-brown water. The bluff looms under the cloud deck. A fast flock of dark birds Vs over 15 ft. above the ice.

We pass over four white belugas. We cross the gravelly beach, the marsh, and polygonal ground behind. There's water near shore greenish coming from the braided mouth of a river. The countervailing flows of tide and stream runoff have written its vagaries. The stream is milky blue now. I see a drum on a bluff. We land in a grad clatter of tire impact and quickly slow to a stop.

We are at the posh camp of Arctic Watch run by Peter and Judy Jess and their two remarkable kids, Matthew and Teddy. Teddy, the naturalist, age nine I'd say. Matt, the artist, age 11.

They've set up a tourist operation full blown here. They've set up a little city where they can cook gourmet meals with wine, Drambuie, Arctic char, carafes of red and white. The "Herman Nelson" was on the fritz. I personally have never heard a Herman Nelson that worked properly. Actually, it's a heat blower, built for people repairing aircraft in the Arctic winter.

Judy and Peter are from Calgary and they've obtained a lease on a couple of acres of gravel beach for their operation. The huts are anchored in the permafrost. They drill, put a rod in, and it freezes in, and that's that.

The structures are something like mylar or Kevlar, taut over an aluminum frame, [?], aerodynamic. Inside a big dining room, kitchen, foyer where drinks are served, and a sleeping quarters, all divided into canvas cubicles.

We were [?] over dinner but first went N. to our camp where there are just nine of us. The camp is above the mouth of the river of Cunningham Inlet—a braided Arctic stream over gravel bars between low bluffs streaked with snow.

We put up a radio tower and antenna, assembled what is called a "Park All"—a padded, Quonset-hut-like structure, a sectional wooden floor, a demountable pole frame, rocks all around on the cover. Once set up with a propane stove inside, it's cozy and spacious. The nine of us fit O.K.

I wandered the hill slopes looking at rocks, and the place is full of fossils—corals, bryozoans, brachyopods are everywhere, a trilobite now and then, stromatolites. I'm already getting loaded down.

Supposedly there's a fish fossil locality inland. The rocks are fractured by ice into piles of shards.

The fossils are from the upper Silurian Duero formation.

At the Elwin Cape Storm Formation, it's Middle Silurian and supposed to be full of Ostracoderms, the cephalic shields can be found.

July 20, 1992

Elwin Bay, Canadian High Arctic

We're up and away, off the gravel bar at Cunningham Inlet across the dun hills striped on the slopes with rivulets from melting snow. Blue, white, dun, bogs. A low, rounded land really. The bluffs are down drainage channels. We head for Elwin Bay—five of us in a Twin Otter—the two young men from the Inuit villages, Lisa, Flip, and me, and a huge pile of baggage ahead.

Snow polygons on the land where it lies over polygonal ground.

The stream water is clear jade blue.

The snow stays longest on the land next to rivulets. I suppose there's ice there instead of soil. Dark bottle-green glass of little lakes trapped on the land, usually margined with ice and snow.

We go east across Somerset to Elwin Bay where there are, we are told, many belugas. Wisps of gray cloud at eye level and Barrow Channel beyond, dark blue with 200-acre polygons of white ice.

A bay choked with ice passes under us, a long, ox-bowed stream ending in the braiding of a gravel-choked mouth hits the bay. The patterns of snow on the land have to do, I think, with slope. They are on steep land, bluffs, escarpment. I see no animal life. Later, I took the helicopter from the Elwin camp and tried to understand the art of flying such a contraption. Both feet and both hands are used in a very subtle dance that sends the helicopter dipping over a bluff or poises it hovering like a dragonfly to settle in a cloud of downdrift-driven dust.

The pilot is grizzled, 10 years younger than me. Hardly any words.

These Twin Otters are amazingly agile but capable of high loads too. We took off from Cunningham on a gravel bar—better than the airstrip and leapt into the air, 100 yards before the bluff, banked and were “outa there” in a roar.

Deeper canyons now, darker earth, polygonal ground on highlands.

Rectangular ground below. Big maps of Iowa, five acres each. What is that all about? The edges are drained channels off the calving ice I think. Caribou. I didn't see them. In a broad river valley, maps of Iowa on flat, broad river bottom. The braided stream green and then blue and then the shallows of Elwin. We land in a roar and swaying bounces in a bright, barren river valley—on the alluvium.

After a considerable bit of hauling gear in helicopters and a little four-wheel “quad runner”, a soft-tired vehicle, and after a long cogitation with a new tent whose pile of aluminum poles bent this way and that, we weren't short a ridge pole and everything did hook together.

Our camp is a windy one—on the shingle above the upper arm of the bay.

Six hundred belugas, or 1/40 of the Arctic population is deep in Elwin bay right in front of us. They are diving and turning in the shallows, and this afternoon an attempt

will be made to catch one. Tony's satellite transmitters are working. Word came in by fax from Cambridge that all were sending in signals clearly.

The tents are up. We wolfed down a little salami and were to go up over the belugas but I would have been in the middle crowding Flip severely so asked not to go and am back on the shingle with the helicopter scouting the animals for a possible catch. They go right up in the shallows at hightide and that's the time they try to drive them in shallower and two people put a buoyed hoop net over the animal's head.

I've hitched a ride in the helicopter that will circle over the belugas. They are collected like schooling fish, many with backs partly out of water, rolling and driving up boils of mud. Maybe a hundred are up in the blue water or the freshwater river, once again in water so shallow they are partly out.

These belugas have heads bent in the mud and the mud stirring is mostly in an embayment just beyond the mouth of a freshwater distributary. The ones upstream are not so obviously stirring the bottom.

One can see long smoke trails of mud in this particular area. I'd say 30% of the bottom is stirred with mud boils.

Here is an embayment just opening to the animals this season. The ice has gone out and they can come in. Has food built up, or is the animal in a molt as it enters fresh water, or is it in a seasonal molt like an elephant seal? I'm not sure. I'd want to know what food was in the mud, in their stomachs, the state of their skin, etc. It's up for grabs for me at my state of knowledge.

Whatever it is, there is obviously a great attraction to this shallow bay and even to going into the flowing freshwater stream itself, the whole school was there—the big, hump-shouldered males, the gray young, and the big white adults. I saw a bit of group behavior involving about six animals in a flat chevron. Others were much more scattered or oriented in the river flow.

Visually, the scene was blue water, ice margins or floating, the greenish shallow boils of brown mud and then the winding bluish channel of the brown stream, white whales, and the shingled stone riverbank.

What a sight. There were maybe 300 animals left in the bay.

Our chopper seemed not to disturb them, remarkably, I thought, given the noise we created. We stayed above 500 ft.

The camp is different than any I have known. The main cook tent is two tents inside one another—12 x 15, shingle floor. The frame is aluminum pipe with interlocking fittings to a ridgepole, braced with metal, a rectangle of pipe at the bottom. Then the guys were placed—polypro—loaded with big rocks and then covered with shingle until buried. An aerial for the radio transmitter was strong. A biffy facing the cove—a triangle of tarp to break the wind and a three-gallon plastic bucket. The wind must come a'plenty. It's 10 degrees C. now. I've been pretty comfortable so far, double jacket, hi-tech long johns, cap (always) dark glasses (no UV) always, waterproof ankle boots (always).

Tom: an old Arctic hand, master of the practical things one needs to survive and work in the Arctic. We can't figure out the frame of the new tent. He doesn't get angry, freak out, or lose confidence. He plus away at it, thinks about it, and finally it comes to him—the ridge pole is up wrong. Everything comes clear but it takes half an hour. He makes his own tents, canvas wall tents. In winter he cuts snow blocks and stacked against the tent, a tarp over all, and they shed the rain, and he's inside with the wind blocked.

He's red-bearded, lined face, easy, in charge, at home out here, I think. He began his work in Baffin in the early 60s. Then he was alone up here. Him and the Inuit. My how things have changed. We've seen three helicopters, came in on an Otter, a tourist place up the island, the Narwhal at Resolute Bay, etc. etc. Tom was a student of Max Dunbar at McGill.

Tony Martin sits beside me doping his transmitters with liquid neoprene. He puts a light shield on to black sunlight as the beluga surfaces. He's full of life, very hard working.

July 21, 1992

Canada, Somerset Island, Elwin Bay

We lay plans for the beluga capture this afternoon—or I should say, Tom and Crew do while we watch.

The detail, as I understand it, goes like this. They get the boat as close as they can. This time they will walk the Zodiac around the base of the hill and when they are as close as possible to seaward they rev it up and rush into behind the whale and when in waste-deep water at the most, two guys are in the bow each with hoops. The closest one jumps in and puts the net over its head. There is a line with a big buoy in case the animal gets free. The net slows the animal dramatically. Then the animal is beached (2,800 lbs estimated for a female).

These guys don't swipe sideways with their tails. Three people can handle one of these belugas. Imagine that!

They are pretty quiet once they get past the idea of trying to get back in the water.

Tony then puts his satellite tag on with four nylon pins.

Tony has a local radio good for 5 km or so and then it goes over to Cambridge and the Arggos signal. So after that happens all between us and the whale is the FAX machine.

Lithium batteries, Tony says, have the same energy density as TNT. He had one explode next door at Cambridge, a tiny one that filled the room with smoke and blew parts through his disk. We use D cells, 20x bigger. They send 300 signals a day to a 800 km up—120 days with elephant seals (400 signals a day) +/- 50,000 signals and microprocessors during its lifetime. Wow, what a battery. The one that blew up slipped over and had a coin cross the terminals, heated up, and blew up.

Finished a little lunch and we see Jack running down the spit. Tom thinks something must have gone wrong with the motor, which they were rigging up. Tom came back saying "There's a whale in shallow against the outer spit!"

So we tumbled out grabbing cameras and coats and headed up across the spit. There it was, cutting in close to shore—a big male, with the small head and fatty ruff. Jack and Tom and Larry maneuvered him down and in, in against the gravelly beach. Jack jumped in, straddled his head and got the hoop over. Tom worked on the tail and slipped a rope covered with garden hose over the tail and then cinched it up. There was a large amount of thrashing from the tail beats. By then I was down the beach to lend a hand, taking the tail line and beginning to inch the big (more than a ton) beast backward onto the beach. By this time Tony arrived with the transmitter package and was soon fitting it in place. He armed it, so pulses were going out.

Then boring four holes through the dorsal ridge—all blubber and connective tissue—then four nylon pins are inserted and locked in place.

The whale was measured (a big male). He was white except for a yellowish film and not deeply scarred.

Soon the animal was freed, head net first and then the tail noose was loosened and off he went back toward Elwin Bay, close in shore, finally to curve out a little as the narrows were approached. A smooth operation, with a remarkably docile animal.

Now we're back at camp and having coffee and waiting for another try later as the tide comes in, back in the bay.

Tom says he can't find any belugas in the bay. Did our big male go squealing and squealing in and did they all flee? Right now we don't know.

It's been calm and 55 degrees F. out today. Clean blue sky and bright sunshine.

Let me tell you where we are. We're around on the northeast coast of Somerset Island. A braided glacial river springing from the low, rounded, tan hills winds down across gravel flats to the upper bay. There much of it gathers into a channel, which is blue from above and empties into the upper bay—a fairly extensive body of water—one mile across to the gravel bar, on which our camp sits. The bay opens to the south over against a rounded mountain, which is often topped by a veil of clouds. Our bar is a long pyramid of gravel and cobbles, riven with great rectangular grooves a foot deep sometimes and usually filled with a row of Arctic plants—sprawling Arctic willow, *Dryas*, etc. The gravel is flat enough to take the Twin Otter, which bounces in and off for amazingly short takeoffs and landings. These planes, especially in a good headwind, dance on their tires, impatient to fly, in spite of carrying large loads.

It blows like hell out now and canvas flaps. The outer bay is choked with moving ice cakes and now the [?] is clear, except for the band of ice on the beaches. I found out that there are ostracoderm fossils here—up on the bluff and so off I went, driving a Kawasaki four-wheel ATV—a little squat motorcycle and big fat tires that bounced across streams, gravel bars, and up against a 500-ft. high scree slope. I looked and looked and clambered a way up—but nothing more than gastropods, worm tubes, mud cracks.

Now I sit in the flapping tent waiting for it to calm and for the incoming tide to ring the animals in. A nap would be nice.

This 24-hr. daylight has its unexpected aspects. One never wants for vision. It's always light enough to see everywhere, even when the sun is rather low. One forgets. And so the wind roars and someone outside shovels gravel on the tent stakes.

July 23, 1992

Canada, Somerset Island, Elwin Bay

Another one of those days! Actually we caught five whales, though two went unscathed and took off out of the bay.

Up at 7 AM or so (my new tent was a joy last night—I can spread my junk out to my heart's content, instead of having it in the cook tent). A bowl of oatmeal and raisins and then off to see how a whale might be caught. We go out toward the point and ahead of me the Zodiac cut along the outer edge and just at the tip they encountered a big beluga and ran him in circles, but finally he escaped. Then the boats took off across the bay to the stream entrance at the head of the bay. I stayed on the point and in about 45 minute's time about half a dozen animals went by me—singles and in one case three together in the channel that runs by the spit.

I could see a gaggle of people over at the river entrance and could finally make out what looked like two animals (it was three). I watched one get tagged—tail flipping and then the boat moved deeper in the bay to work on another. Actually, it was a mother and her little gray calf.

Finally, Jack Orr (he lives in Winnipeg) came over and offered me a ride in the Zodiac. The bay is remarkably shallow and we bumped on the bottom a time or two and then onto the mud-flat. There was a pair of medium-sized animals high and dry, one with a tag in place. Down the beach deeper in the bay was an enormous old male—curled pectoral fins, a band of muscle and blubber epraxially and below a huge, sacky body—stranded hard and fast, tail toward the beach (3,200-3,500 lbs.).

On down still farther was a mother and gray calf pair, out on a sand bar, that Tony and Tom soon worked on.

I waited on the beach a long time waiting for the tide to rise. It finally came up a little just as I had a chance to go back to camp. Larry and I headed for lunch.

All the strandings were the direct result of the intervention of the Zodiac, and only two were netted.

The old male, who must have weighed 3,500 lbs., thrashed and bent his body and seemed thoroughly unequipped behaviorally to wriggle off. Only once did I think he used his curled old fins to scoop with. The sideways wriggle of the tail seemed to inch him forward but not much, and certainly not enough to do any good. He was feisty and bit Jack on the ankle, which left a bruise but nothing more (through a boot).

I looked at the bottom where the whales had been leaving the mud plumes when we came in. It was gravel covered with mud with a yellowish diatom film. Pockmarked everywhere were the burrows of an amphipod—the biggest I saw were ½ in. or a bit longer. I kicked my boot in the pools and at times was able to dislodge buried amphipods so that a pool would contain four to five dozen swimming. Then, later, I began to note inch-deep piles of cast exoskeletons of these crustaceans in ripple marks. No, I'll wage those belugas were feeding up there. Others were up the river and not apparently feeding, so maybe more than one thing was going on up there, like the skin sloughing mentioned.

Later, all animals were off the beach but one tagged animal, and so Tom and Larry and Jack and Gary went back in the Zodiac and tried to take the animal off the beach. It repeatedly went back on the beach even though towed out in five ft. of water. No other beluga was then in the bay by that time. Finally, Tony cut the transmitter loose as he was afraid the animal would repeatedly strand. So, two radios are out to sea today, not three.

Flip and I cook dinner. Steak fried onions and cabbage and bread. Well received. The tent got very hot with the cooking and I had to go outside for air.

Tom says Inuit “know” things they've experienced—hence elders become priceless sources of wisdom. Not like us who learn things from books, lectures. Hence it's hard to ask them to explain, or reason out a solution, or to tell them about stuff in books.

July 23, 1992

Canada, Somerset Island, Elwin Bay

A few words about belugas (which is what they call them in the Canadian Arctic—belukha, in Alaska). They strike me as incredibly vulnerable. A crew in an

outboard skiff can, I think, take them almost at will. A big beach semi might catch them all. Net them and they give up almost entirely, especially if their head is covered. They swim in very shallow water habitually and one often sees them on the flats with part of their back exposed. They bolt upon hearing a motor, but the next day they are back and can be caught again. They hang at the ice edge where they can be shot.

I'm interested in how aggressive the old male was. He calmed right down with a net over his head. The smaller animals are sleek and not sacky like the male. He was mountainous.

The animal kill in the Canadian Arctic is 60. In Greenland, 700, and at least [?] 1,000, since they are shot.

Then there is ice entrapment and the kill goes up and this happens sporadically.

July 24, 1992

Canada, Somerset Island, Elwin Bay

Today is a day off, both for us and the whales, and it's a wonderful one, bright sun, sharp with UV, I'm sure. It was clothes washing day and lots of skivvies, long johns etc. dangle from the stays. It's calm so far and that helps a lot.

I took off on the ATV to see if I could find one of the ostracoderms in the Cape [?] Formation (Upper Silurian) that forms most of the cliffs around here—battlements of stone 1,000 ft. up, and long scree shingles of sandstone, dolomite, and limestone.

My aim was to get up among the rocks to see if I could find the cephalic shields of the ostracoderms they say are here. Jim Savelle, a sometime geologist, says over in the next bay every fourth rock from the top of the section will have a shield. He says the marker is the presence of stromatolites.

I wended my way up the rock plain and up at the base of the escarpment, and at one place where it got steep tipped the ATV over. I easily righted it and was undamaged by the event. It took a while to get it going again though. I had visions of walking back to camp.

The escarpment is marked by a glacial bench that extends up the valley, perhaps 100 ft. up from the spit-airfield level.

I picked and picked and found nary a shield but I did grow wary of the rock slides which seemed right at the edge of instability to me. Once I pulled a rock and heard a grinding from other rocks. I looked up at the towering 100 ft. slide of rocks at what might have been close to the maximum angle of repose. After that no hiking up the slope and no pulling unless I just had to see.

Down on the lower slope I could see that it was formed by water runoff and ice—standard alluvial fans with little streamlets playing across the fan-like surface. Then on the flats a rectangular set of grooves marked the landscape. These grooves, when there was a little gradient, grew deep enough that I had to slow the ATV way down and bump across. On the flat they were shallower. I see them as being formed by melting and shrinking of an ice-snow sheet. The first crack guides water, the edge thaws and splits, etc.—a tensional system.

I obtained a copy of *Common Arctic Wildflowers of the Northwest Territories* with Dr. Sylvia Edlund as artist.

The flowering plants I saw here: *Papaver lapponicum* (Arctic poppy), *Draba corymbosa* (Arctic draba), *Saxifraga caespitosa* (tufted saxifrage), *Saxifraga flagellaris*, *S. oppositifolia* (purple saxifrage), *Dryas lutearifolia* (Arctic avens), and *Pedicularis sudetica*.

Now for a nap in the bright sunny day; now that lunch of onion and peanut butter sandwich is past. Then stew for dinner and cake and cabbage.

I'm outside sitting on the radio antenna box, which is full of shingle to hold up the wire. It's absolutely still. We have buried the outhouse contents in three garbage bags. It wasn't more than 15 inches down to permafrost. Tom tells me they dig frost pits, put a little house around them and anything will keep. The sun skirts low over the Elwin Valley and up toward the rounded bluffs. I look over the gleaming flat bay and can see the blows of dozens of belugas up in the river mouth—columns of vapor maybe five ft. high at times.

It's a little nippy on the back of my neck now. So, I go inside and sit in the cook tent, where it's warm. Tomorrow we try for another animal.

Tony has heard back from the first of our tags and it transmitted and then quit. The others are transmitting and the animals are reported to be going south. Though just now Gary came in from the end of the spit and lo and behold one of our tagged animals swam back around the spit and into the bay. Imagine that!! What to make of that? Was he not frightened enough to stay out? Was the school attraction so great it didn't matter. I think the latter.

Well, I think I'll quit for the day. If this is the whale whose transmitter isn't working, Tony will try to catch it. Tony is something! A very kinetic guy, always in motion, always with the slangy, rapier comment said in good spirits. Always first in the water, knows his stuff, and gives everything he's got. Good company indeed!

July 25, 1992

Canada, Somerset Island, Elwin Bay

Today we make an attempt to place another tag. This will take place about four in the afternoon when the tide comes up. Two whales with working tags are here again and perhaps the one whose tag quit on us.

It's a pretty good calm day again, though with a 50% overcast of cumulostratus clouds. I had a snooze this morning and then went out for a last try at finding an ostracoderm.

I clambered all over the lower slopes of the bluff, below the place where anything falling off the castellated bluffs and spires up on the upper cliff. Sure enough the rock was there—dolostone—according to the Canadian Geological Survey report, but aside from trace fossils and most abundant, a small bean-like organism, I found nothing. No stromatolites were in evidence.

I think they are at Port Leopold, 30 miles to the north.

But it was a good little ride on the ATV—out along the airstrip and thence back to the bluffs where I was able to work on blocks of rock from up the cliffs. No ostracoderms and not even any stromatolites.

I came bumping back to find Tom Smith on his way out, worrying about me a little. I'd been gone two hours and there was still 1.5-2 hours to go till beluga capture. Sorry, I was, but feeling they were antsier than they need have been.

We set an Arctic char gill net to see if we can catch fish for dinner tomorrow. So, another day of tagging. The net caught huge blocks of ice and failed dismally.

[Map]

What are these belugas like? They lollygag along in a loose school, moving maybe one knot as a group. Animals putter along occasionally a head is thrown out, a back appears very briefly, and mostly one hears blows and occasionally sees a columnar vapor spout. only when they are in shallow water—the river mouth—does their visibility pick up and their backs appear frequently. Mostly you pick them up by noting a streak or slick on the surface and then a bit of a head.

The old male we tagged was an enormous pile, just monstrous on the beach, and angry too. When the head net was off he went for Jack's ankle and only the boot saved him.

In the water they flow along as if they were greased. When they fled the bay they streamed out as singles and by twos and threes. They obviously knew the channel well.

It is remarkable how simply they can be stranded. One female and gray young seems to have have stranded on its own with no major intervention from us, just the general disruption of our capture attempt.

They are incredibly vulnerable—surely unable to withstand the increased incursion of man in the Arctic without some degree of regulation and protection.

Tony tried out his Telonix receiver, which picks up a direcct radio signal as it simultaneously goes up to the satellite. I was surprised at how brief the blip was—just a click of sound, but then the receiver identifies which radio (animal) is involved.

When they are trapped by freezing sea ice they may be killed by dozens or even hundreds. The rule is that if not shot they will die anyway, which is probably not true.

We're about ready to make an attempt. It will be Tony, Jack, Larry, and Gary. Tom, who is recovering from a bit of laryngitis or whatever, will stay on the bench. He's usually first in the water. Ginger beard streaked with gray, lined face weathered, raw-boned, stainless revolver on his belt, canvas pants. Independent mind, very welcoming to us, a respecer of competence, a dog breeder and trainer.

Well, the tagging of the day apparently went well. Tony, Gary, Jack, and Larry headed out in the Zodiac for the stream mouth in upper bay. I rush for the sand spit to see the belugas round it and bend out to sea once they got the word. We could see the capture, the tail splashes, the group standing in the water, presumably as the tag was going on.

Soon the whales came racing out of the bay turning close along the point on which I stood.

Soon the waves were washing on the beach enough to roll the gravel and cobbles. The whole channel close to us was awash with waves and beneath them the long, slim, white shapes going as fast as a beluga can. They seldom breathed until well out of the bay, except for the gray babies bucking along.

Now we're back in the Park All, the smell of roast pork in our nostrils, waiting for the boys to return.

It seems remarkable to me that these whales returned today—not the wariness I'd expect of animals with members just tagged.

I keep thinking how to describe this land. Austere? Bleak? No, not for the things that live here. They find a way. They choose a time and a place like desert animals and then wait it out. They are full of strategies to deal with the climate and to find things to eat. Those three polar bears coming up the bacon-odor trail, were as fit as any animal. It's we anthropoids who invade by our wits and our impedimenta of tents, jackets, down

borrowed from birds, carbon skins to sleep on—the air-filled hair magnificent insulation. We see the world as bleak.

Simple it is. Scree slopes of ice-parted stone, rounded and carved by an unimaginable burden of ice—more than a mile. Now in July streaks of rotting snow remain and the scree gives forth the sound of tumbling water, hidden somewhere down beneath the blue bay, dun cliffs, white streaked [?] and almost no plants. yet the bay teems with life. Belugas bob and bray like cattle and beneath the surface a cacophony.

We read *U.S. News and World Report* about the U.S. election and look at the clothing and car ads and jaw endlessly inside the flapping tent, a capsule of warmth set on bleak rocky shingle—held at the end of a lifeline composed of Resolute Bay, the Narwhal Hotel with showers and plentiful food. Leave your boots and jackets at the door and the Twin Otter that tomorrow will bounce on huge soft tires across the ice cracks engraved in the shingle and swallow us and our gear up for the half hour flight across the Barrow Channel to Resolute. Then on the 28th—a 737 to Montreal.

I came out of the tent to head down the spit to photograph the belugas coming out of the bay, since Tony and crew were about to head across the bay to the river mouth. Instead, as I came out, the team cornered a 12 ft., 8 in. beluga—a gray animal almost completely transformed to white—just remnant gray on edges of tail stock, right beyond camp toward the spit. The animal ran along the shore and it seemed to me with a little agility could have escaped. Instead it almost ran into the Zodiac prop and then when Gary and Larry were trying to get a net on it, it poked against the Zodiac itself on the other side. Keystone cops!! Shortly they had the head net on and shortly the tail noose was in place and a line run up the beach to a little danforth anchor set in the beach shingle.

I cranked away with my camera and may have caught the whole sequence on film, except that I had to change film at the crucial moment. The little critter put up something of a fuss as the transmitter was on and was then released out into the bay. At first she curved upbay, but soon enough turned for the entrance. I hope she could hear her school and return to them.

Tony first checked transmission on the local receiver (it worked) and then contacted Cambridge to let them know their last transmitter was on.

I am in a constant state of surprise over how easy it is to catch belugas. Their imperative is with their school and I suppose the sound communication going on constantly. It seems to have few safeguards against boats and man. I wonder what these same safeguards consist of for things more pertinent in its world, such as polar bears. I don't think they get taken often.

For us it proved almost ridiculously easy to catch these huge beasts. They must keep together and alone they are lost and they must navigate the complex channels of this shallow bay—both of which make them vulnerable.

So before lunch we've finished! Tomorrow we pack up and head back, 136 journal pages later. I head for Boston after cleaning up a little at Resolute.

An old Arctic hand, now, of course (don't listen).

July 27, 1992

Canada, Cornwallis Island, Resolute Bay, The Narwhal

I got up about 3 AM and it was absolutely flat calm. The streaks of snow were so faithfully reflected in the shallow bay that it is difficult to tell reflection from reality.

At 7 AM we're up to break camp, take the long house down, divide gear into two piles, one for Cunningham where Flip will go with Tom, and another for Resolute where

Tony and I and Gary and Larry will go. We said our goodbyes—the Cunningham crew went first. The Twin Otter came in and I went up the shingle bank to photograph it coming in. I tried to get out of its line but no luck. It was really low so I moved down the slope with the plane apparently coming right at me—its big, soft tires hanging down.

Finally, I threw myself down on the slope and the plane roared overhead, so close it knocked over the 7½ ft. radio antenna, six feet from me. The guys down the hill were laughing their heads off. I picked myself up and dusted the glacial clay and we walked over to load the plane, which had taxied down the cobble berm and swung around near the duffel piles. Out stepped Duncan Grant, or should I say, out crabbed Duncan, a rawboned ancient pilot who has been up here for many years. He has an almost spastic walk. He smokes like a chimney and cusses constantly.

Was it a knock down? And then he circled and buzzed us again as he cut out to sea. Anyway, soon enough the plane was loaded and away. Flip will head for Creswell Bay to the south. As for me it has been a magnificent, varied experience, but I'm glad to be on my way. I need a bath and most everything I could gain we have done. One is rather limited in movement because of bears and I especially, because of my age (not my ability, really), my chance to move very far is limited. I behaved myself pretty much, but I was watched, too. So, now on down to Boston and the lower 48, Dick, Teresa, Ben and Thomas, and the Schevills. I wrote and wrote and wrote and interviewed and the story is clear enough. The curious, gentle beluga is in trouble, the familiar trouble of facing the spread of human culture and its technology. The contest is in no way equal and we must learn to control ourselves. The beluga may be the most vulnerable of whales. What other could be caught by two men with a three-ft. head net and a tail rope?

Tony Martin says he has been working at developing a satellite tag for seven years, among other things he has done. His background is partly at least in computing and he is a tinkerer. He shaves this, fiddles with that, tests this and that—a good instrumentationist. Like all such tags a percentage work and a percentage don't. We have one out there from this trip that sent one position and quit.

The team at Cunningham Inlet saw a tagged animal. One of ours? From last year? (Yes, the one that's not working.)

Flip photographed it with a very long lens and thinks it is the tag that didn't work long from Elwin.

July 28, 1992

Resolute

Packing up, palaver with a retired friend from Boeing in Seattle. Been everywhere. The Narwhal has about 40 rooms all told, including some doubles upstairs. It's a typical Arctic desert day—sharp, bright sun now over the austere landscape.

My plane leaves for Montreal at a little after 2 PM. I stay there a night and head for Boston and the Schevills and then out to the Cape and Dick and Teresa, Ben and Thomas.

The Canadian North plane comes in, circling once because of a low ground fog and then comes in and lands. The terminal is full of people, many from Peter Jess's camp.

I sit up front with Tony. He talks about the construction of the satellite tag. Much is done in his own lab—he gets one piece—a RF oscillator that goes beep. The other is the control unit.

Pure tone (access) ID code followed 356 binary bits of data. Tony takes a piece of paper from me and tells me all about the marvels of this tag of his. The lithium battery is equivalent to TNT. A 1% battery shorted out [?], blew up and went through three drawers in his Cambridge lab.

[Tony's notes about his transmitter.]

Tom—

I found I was with the quintessential Arctic man, one most comfortable camped beside some bleak bay where the wind will howl and his tent ropes thrum in the icy wind. One who knows to watch downwind where the bears may come in on the wafted odor of bacon being cooked and who would fire his everpresent revolver in the air when they were 50 ft. from the cook tent and then expertly edge them away, back toward the ice-choked sea until they splashed into it, turned, and swam toward the far shore half a mile away.

This is his land. He is complete here, ginger beard spiking out past bright eyes showing through a creased and wrinkled face. He's of this land in his bones, I thought, and that's all a man can ask.

July 29, 1992

I headed down to Boston and rented a little car and drove out to the Schevill's and then to Alan and Carrie's. A fine evening with the Schevills, and then over for brunch at Carrie's.

Tibby was there, writing a book about William Paley's daughter and her conversion. She is a clinical case.

Then on down to the Cape to Teresa, Dick, and Ben and Thomas. Good time melding in with their lives for a while. Then home on August 4th to prepare for Alaska-Greenland.

Belugas

The ___ -ft. white whale of Beluga blew a bubble from its blowhole atop its head, rolled and sucked it into its mouth through big, expressive eyes and then spat out a work of art worthy of Cellini, a shining bubble, gleaming silver and spinning slowly in the water like an elegant Christmas tree ornament. The big whale turned a little to view it with a critical eye. The bubble rose, expanded and fragmented. The whale casually pursed its lips and sucked it in—transitory art that the huge animal seemed to appraise.

September 8, 1992

Alaska, Anchorage

I'm in my Holiday Inn hotel room in Anchorage on the first day of a long trip, which will go through Fairbanks to Nome to Montreal to Greenland and then home. The mission is to look into various aspects of the status of the belukha (beluga outside Alaska) or white whale.

I'll be joined by E. C. Evans and then give some lectures at U. Alaska, where I have been invited as the seasonal invitee by the students. Then we're off with Lloyd Lowry to do a spotting study of Norton Sound.

We'll stay at Nome, and then off to Baffin Island and Greenland. We'll go up the coast, but at this point I don't intend to go to the hunt at Upernavik because of hostility of the Inuits there during the hunt, which Bertel [?] describes as "murder." The members have suggested that twice as many are being killed as the population will stand. Ken Bloome, and Brother Bob will be on this Greenland leg. Tomorrow I attend the Rural Community Action program, which includes a group proposing how to keep Alaskan-W. Canadian populations healthy.

I'll stop now and watch the ballgame.

September 9, 1992
Anchorage, Alaska

Massive, direct Matthew Iya of Nome, the Chairman of this section of Rural Community Action Program, and a carpenter when he is not representing his people in meetings such as this, starts the afternoon session by saying:

"Before we begin, I propose that we honor Lloyd Lowry by giving him a plaque or something. In all the scientific work he does, he never forgets the welfare of the animals he studies, and he never forgets the needs of our people either."

The deep voice of Burton Rexford, Chairman of the Alaska Eskimo Whaling Commission broke in: "By acclamation."

Lloyd Lowry, gray-templed and steady, always looks as if he was ready for a flight over some cold Arctic sea. I suspect he is most comfortable there, most whole. He likes the Eskimo reps who sought to honor him, and is direct and low key.

. . . . a bushy-browed man with a deeply lined, wise face capable of giving itself over to wholesale humor. He, I knew, had stood off the U.S. government on behalf of the Eskimo values of his people—the traditional hunt of the bowhead whale, and today the villages he represents vie for a quota of whales on which much of the fabric of their society, he said, depends.

Lloyd kept his feelings to himself and faded into the group heading for coffee.

The meeting today was held in the big meeting room of Rural CAP, which is a program from the old OEO of Lyndon Johnson's great society. Here it fills a crucial niche. A whole society of native peoples struggles with the almost desperate equation of finding their way, in a generation or two, from a time when they knew everything needed to wrest a living from a desperately difficult part of the world, one where few plants grow and where the lights go out all winter and outside is glacial cold and dark, almost that of space. They now found themselves in a subtle conflict with a network of foreign laws that bit by bit bid fare to strip them of identity and connection.

Some like Matthew and Burton had learned well how to fight back. I admired their rock-hard audacity and their willingness to reach out to Lloyd, whom they had grown to trust, but who was not one of their own. It didn't matter, like them he was practical, direct, and his word was clear.

Everybody seemed to like and trust Rural CAP director Bob Polasky. He was the only one in the room with a tie. His domain dealt with headstart programs, resource issues, these avenues for native people to find their way into the 20th Century. Ways to winterize their houses, drug problems, and more. Much came and went through his doors.

September 11, 1992

Alaska, Fairbanks

Evan arrived yesterday and we've been having a grand time wrassling with this and that. I will try to get down some of Evan's grand thoughts that poured out like rain during breakfast.

I told him I was going to write a chapter on population control and he reminded me of several things and gave me some new ones.

He talked of the Polynesian people who controlled their population by selectively killing young people of a chosen class. They were allowed to live with the others but not to reproduce and then killed (by clubbing or strangulation).

Arabian nomads (Tuareg?) and Eskimos . . . these were formalized in social rules.

Edward W. Applewhite wrote about Buckminster Fuller in *Paradise Misland*. Contains a chapter on abortion that Evan says is good.

The Polynesians, faced with the absolutely finite universe of an atoll or island, institutionalized population control, at least in part, by selecting a cadre of young people who were ritually killed at a certain age. How members in this group were determined isn't clear to me.

Something similar existed among some desert Arabs (Tuareg) and among the Eskimos and Inuits—I need to learn more. In each of these cases, the control was ritualized and approved by all including those who were sacrificed. Bushmen would go along and leave the old behind, and they expected it, as did the old Eskimos, who were put out in the snow when they became unable to keep up the rhythms of society.

Denali slips by the west wing—20,000 ft.+—a huge, complex, snow-covered mass piercing the highest clouds and ringed with glacial valleys. In the north a great valley glacier swings around the mountain. Below are glacial-fluted hills and stream-crossed lowlands. The hills are dotted with cirque lakes and only dusted with snow except in the deepest cirques that hold what looks to be permanent snow. Clouds deck the lowlands and we see little more.

Now the clouds open and a white range is below, all glacial topography, snow fields, lakes, scree, and rivers braided with gravel. Now it is gone again and we slope down into the cloud deck as Fairbanks on the banks of the Tanana[?] approaches.

A long glide in the clouds, bright at first. It darkens at 1,000-1,500 ft., breaks [?] after the yellowing forest and twisting streams of the Alaskan interior. Now Fairbanks looms, rectilinear, much water in the squares, freeways, trailers, houses, the oval of the school's track, industrial plants, the ballfield gone yellow, the aggregate plant, with shoals and draglines in a bow of the river, a pond for float planes next to the runway as we touch down.

We land and are met by MA student Jill Anthony, who is working on the sea otters of Valdez, I expect as a way of having a baseline should there be another spill there. She is intense, wound up, nice, a list maker. She tends to us and dumps us in the Wedgewood Manor, a sprawling studio apartment complex fairly near campus.

We go out to U. of Alaska. It is up on the high ground—a fairly undistinguished looking campus, with now and then the interesting building. It's very much a campus of its staff, and in northern biology, physiology it has excellent people.

We met with the dean, Vera Alexander, who worked on sub-ice ecosystems and she is a grand lady of wonderful presence. I liked her immediately and could see a real light in her eyes.

I gave a talk on spinner dolphin society. I've done better. I'm tired. Then to Mike Catellini's lab, where we took it easy, Ev and I, and then went to meet the grad students, who gave us a potluck at "Copper House," a nice place for such a function—like a nice, gracious house. The students showed us slides of their work.

Then to the Wedgewood Manor, where I prepared tomorrow's talk on how I do science.

Time to quit. I'm pooped!

September 12, 1992

Fairbanks, Alaska

Saturday! Ev and I are stashed at the "Wedgewood Manor," a great, sprawling, shlocky apartment complex erected for pipeline laborers and technicians and their families.

It had snowed last night, covering the walks and the car windshields and hoods. On the way back, without the slightest difficulty in doing so, I slipped on the walk and landed on my hip and shoulder. The hip is only slightly dented, but my shoulder took a good crack and is pretty sore. I'm on anti-inflammatories and exercises (painful) to keep my range of motion up. It takes ten minutes to swell and set up and then I can lift it only through considerable pain. Keep it up, Knute and you'll be OK. Let it set up and you'll have trouble.

I've had a couple of student appointments today and talk tonight about the philosophy of science, as if I had deep things to say there.

September 13, 1992

Fairbanks, Alaska

Today is Sunday. It snowed all night, very early unseasonable snow but continuous. We scrape it from the windshield, it slides off the roof, and we do it all over again later on.

Last night I went through a time with my shoulder but thanks to a heating pad provided by ever-attentive Jill Anthony, I wasn't desperately uncomfortable. I have trouble raising the arm, but with a little effort I make it to maintain degrees of motion as it heals. It is getting better.

We picked up lunch stuff at a local store—a huge barn of a food and convenience store and then headed for campus for a "picnic." The long trip was out because of snow so we toured Fairbanks instead. We stopped at the Chena River, which becomes the Lanana—a big, burling stream ¼ mile across, brown and turbulent.

We saw larches, black spruce in bogs and on permafrost, and white spruce on the uplands where there is no permafrost.

Then we hit downtown Fairbanks, the usual plastic eateries—Denny's, McDonalds, etc., and most businesses in largely windowless, warehousy buildings—pretty soulless really. Nothing seemed built to last. Downtown we saw the Polaris Hotel in the low rent district—only now and then did we see much of nature. The black spruce flats are spindly dark bean pole trees, very small really and very dense.

Then we visited the University Museum, a densely packed place with a sort of hodge-podgy exhibit space. Much nice stuff. I was tired by that time from the pace and because of light sleep last night.

Then a potluck at Copper House and home. Tomorrow we move over to John Burns's place.

I want to see him socially, but he is also reckoned as a beluga authority. He's retired now and still doing contract work—this time for Kathy Frost. I sense some difficulty somewhere.

Then we had a potluck with some of Lloyd Lowry's halibut salad—elegant, wine, desert.

Kathy gave me quite a dissertation on her work—much opinion. The Canadian numbers are very conservative and the allowable take very low. Kathy mentioned 6% as acceptable. Canada is closer to 3%. I don't know enough to comment. She had earned the trust or at least acceptance of the Inuit people on the Eskimo beluga commission. Kathy spoke of the Eskimo use of consensus as a means of decision making and said it worked if the group was modest. She mentioned 100 people. They all have to come to agree or the deal is postponed. For larger numbers it doesn't work.

She says peer pressure in this process is crucial.

She spoke of the very longstanding opposition of Inuits to officials who did "stupid" things, did things in incomprehensible ways. I wonder how far one can bend and still protect the animals. All seemed to agree decision making needed to be local.

It was a nice affair at Copper House. We had a good time and Jill was relaxed. She's been our shepherd on a tight, full schedule and has been very attentive to us and to making sure all went well. Very nice person.

Oh yes. Vladimir Burkenoff of Petropaulusk Kamchatka has invited us to Bering Island to do a story. He was very welcoming. It could be good.

September 15, 1992

Alaska, Fairbanks

The storm has broken! It has left behind icy streets, frozen brakes, and very treacherous footing. But the sky is clear and you can see the V's of birds against the blue, the still-leafed birches and willows are bowed with clumps of snow, but they begin to fall. Will the albedo of the earth be enough to melt away the ice and snow on the ground, or do we plunge directly into winter?

The light slants in, low and peach-colored over the horizon. Nome, we are told, is clear, so it seems as if our survey will go ahead on schedule.

Today I give my last talk on schools, flocks, and herds, and then, on Wednesday, we have a free day to regroup before heading out by plane to the Seward Peninsula, and the Nome Nugget Hotel.

Last night we went to dinner with Lloyd and Kathy, and both Ev and I felt that intense Kathy began to come off of it—and emerged as a person of strength and commitment, very pro-Eskimo, but with her feet on the ground. Ev wondered if she read much. I pointed out that she and Lloyd both have published a good deal and are the authorities on beluga populations in Alaska.

Kathy described her installation on the Eskimo beluga commission or committee. She was at first opposed by Marie Adams, an Eskimo activist friend from . . . but she was voted in.

Wayne, Testa, Ev, and I went off to lunch at a local ice cream/jazz parlor and had a bowl of soup and an ice cream cone.

Wayne has worked with Weddell seals in the Antarctic—done a good underwater in Schevill's upside-down cocktail-shaker viewing chamber. He told us even with five

feet of ice there was enough light to see so long as there was no snow cover. A blindfold test had not worked.

We returned to campus where Jill has provided us with a table and two chairs and where I meet with various students. I met Ben, a mainland Chinese doing chemical ecology. Mostly he wanted to know about exams.

Then I met Gay Sheffield, who has done much fieldwork with walruses on Round Island and on the Diomedes. She was an interesting field person, full of humor, and not at all sure about the academic side.

Then lunch with Wayne and back to my table. I gave a seminar on schooling at noon. Whew! What a schedule.

September 16, 1992
Alaska, Fairbanks

This morning we moved from the Wedgewood (comfortable, dark) to John Burns's house. I wanted to see John after all these years, and I had been told he knew more about belukhas than anyone—and so it proved.

He met us after breakfast and took us up into the birch forest on the hills above town to his place. By the time we reached it we were in snow. The road ran through the banks and without John's four-wheel Subaru, we wouldn't have made it. He's retired from Alaska Fish and Game and much involved in education. He is finishing a volume for the Society for Marine Mammalogy on bowheads.

The conversation poured out. He's 55 and retired as head of the marine mammal unit when a budget crunch hit—not because he had to, but his retirement and salary savings saved the unit. Sounds like John.

His home is a very nice place in the light and airy forest. Trim, full of mementos of his many travels. John lived at Nome and speaks very fondly of it. The Bering Straits sluices animals in between the Arctic and the Bering Sea.

John is a real field man . . . more, he is one of the real synthetic thinkers in my view. Ev concurs and mentions his elegant use of language.

We talked of many things about the people and the animals. Let me now list some questions I want to ask so I can generate a good tape:

1) Is the Alaska beluga in reasonable shape? 2) What about Canada? Greenland? 3) Tell me about the Alaskan subsistence fishery. Are the animals essential to a way of life? Is that way of life ending? 4) We have instituted some welfare programs for Eskimos. What is their effect on belukhas? 5) What do these Alaska "Eskimos" call themselves? 6) Describe the appearance of regional centers v. villages. 7) What is the level of population increase amongst natives in Alaska, Canada, Greenland? 8) What can you say about the proposed independent homeland, Nunavut, in Greenland, Alaska? 9) When did belukha hunting start? Basques, Norwegians 10) How do you spell belukha? What do you prefer? 11) How do you describe the zoo—[?] of the beluga? 12) Tell me about "availability" and "abundance." 13) Much belukha is used for muktuk. What is it? How do you spell it? How do you cook or eat it? Is it a staple or a luxury? 14) When belukhas arrive, is it true that all that can be caught are—and that if the neighboring village is in need, food will be shared. What happens to the heart? Is there waste? 15) What are belukhas doing when they go up rivers? 16) What is the status and prospect of the native male? 17) Are Cook Inlet and St. Lawrence the result of the Little Ice Age?

I was never able to ask all these seriatim but our discussions did cover many of them.

September 17, 1992
Alaska, Fairbanks

The latest word is that Mt. Spurr has erupted again and Anchorage Airport is closed. Our plane may not get out. So we: “mill about smartly,” “stand by to stand by,” and “remain flexible but don’t go limp.”

John and I discuss: We will explain the world whether we can or not! It applies to water-witchers and priests and very much else. I say it lies at the basis of culture, of the formation of value systems by which we can live in the absence of real understanding of the universe. Now, science intervenes and begins explanation and conflict is inevitable, until science wipes away the last demon or god.

Polar bear population increases. It has perhaps doubled [in the last?] 30 years about. So now they have increased take of belukhas—savsaa in Eskimo—“animals whose way is blocked,” in western writing translated as “animals who are trapped.” These are predictable.

Fresh water freezes at 32 degrees F., seawater at 28 degrees F.

So when belukhas go up a river mouth to feed the freshwater plume overriding the seawater may freeze and trap the animals. The distance to open water may be so great they can’t escape. John concurs that five miles of ice can trap them. That’s about what we saw at Cunningham Inlet on Somerset Island, Canada. An animal swimming under ice cannot use all its capacity to escape. It must either have a perceived goal that will allow it to breathe at the end, or search and return to base.

What, to a belukha, indicates a place for breathing? Is it light shining down? Is it noise of ice grinding, is it both of the above? What happens in winter?

John says belukhas winter in the central Bering sea. How much do they feed? Do they live on their blubber store? I’d guess their sophisticated close-up, clutter-resistant echolocation would allow them to feed easily all winter.

Mt. Spurr erupts. The Anchorage area is blanketed with ash on and off and our Fish and Game plane can’t take off. So Ev and I plan to head for Nome anyway to see the land and the Norton Sound. So we are going by Frontier Air, which costs about \$500 each. We will fly down the Yukon Delta to Galena and then transfer to Nome. It’s 1:45 PM. We board a Beech Craft 99D that holds 15 passengers.

We head for Galena down 1½ hours toward the ocean on the Yukon and then transfer to hit Nome. I sit right behind the pilot—a slim, sandy-haired guy with captain’s bars—50-55, the co-pilot—slim, moustached, 32.

It’s overcast here, snowing in Galena. Here the ground is covered with snow among the forest trees—alders, aspens, and willows—a touch of yellow here and there—and dark foliage of white and black spruce. Others are going to a potlatch for the deceased, and some native people are hunters, I’d guess. We swing into the runway, a Delta jet turns away as we rev and take off. The rooftops of Fairbanks are snow-covered rectangles, the [?] still and gray, fields are white. We circle up into the mist.

The hope is to get to the Seward Peninsula, to see Nome and to meet Lloyd Findley. There tomorrow—this will let us fly in to the Seward Peninsula and at least see the place before we have to leave for Montreal and Greenland. I’ve already had a rich and valuable time in terms of the story here in Alaska, both Fairbanks and Anchorage, so seeing the belugas is an added hope, but not I feel I know important personalities in the

beluga equation, a good deal I didn't know about the animal, and a good many of its trials and prospects—all good stuff. The time with John was especially valuable, as was Rural CAP. So up in the cloud deck, time for a snooze.

We land at Galena. a great big hangar tower and long, well-lighted field and river-bottom willows, braided stream, and a slushy mixture of rain and snow. Into the Frontier terminal room—plywood, coffee, notices about the potlatch at Huslin for six people—memorials “In loving memory of Auntie, etc. etc.” And a notice at the bottom—“No alcohol please.” The schedule of ladies basketball for Malakleet and some other towns.

We transfer to a Piper Navajo with pilot Larry—38. I'll bet this big airfield has a military history somewhere when I see the covered radar dome and air force helicopters and trucks at the big hangar.

Low alders blowing, gray sky, flashing runway lights reflecting from the slick runway.

We're off in moments, the wheels whack into their wells. Eutrophic bogs below, dark spruce and willows, tendrils of water plants and sphagnum creep out into the open water. We're at 300 ft. and merging into the haze. Bleak below, dark filagree of water and streaks of snow, bars[?], and half snowy ponds, a tangle of brown channels. All gray now. 400 ft. The sky lightens as we nose upward. The propeller tip draws a pure circle, faintly rainbow-hued. A front came in last night, but it may be better now as we are about to skim along the south shore of the Seward Peninsula. Jim's all jokes in the terminal and all business up here—air chart on his lap. Snow still clings to the corners of the windows at 145 knots.

An old indian man who seemed to tend the terminal and our pilot both mistook me. One said, “You live out there, don't you? (Nome)” Larry said: “Run the pizza parlor, don't you? Or was it Medevac?” “No, just quaint to the core folks.” Advice: For fine cuisine the Nome Nugget, for good food Fast Freddie.

It's not far to the Bering Sea here. We'll encounter it at the base of Norton Sound, not far from Unalakleet.

We'll get to Nome all right, but will we get out to make connections to Montreal and Greenland? . . . Too tight!!

The snowy land appears below—river bends, black loess-cut banks and white whites. Jim looks at the aeronautic sheet, pokes his well-worked hand calculator, and his graphs in a taped pocket, dog-eared with use. The sun glints on the engine [?]. The land is gone again. Jim's glasses are missing an ear piece. He has it tied together with carpet thread. Out comes the airport directory. He adjusts the radio direction finder. Maybe it isn't carpet thread. Turbulence bounces a bit. Is that the coast? It's all white. Larry talks quietly into his mouth mike, thumbs through the thick book of airport instruction. Loose leaf all right but each is ensheathed in tough plastic so it won't tear out with use. On an instrument right in front of Jim with compass designations on it, a little white card flip-flops up and down across what might be the horizon. He steadies it with a twist of the dial. “We're at 1,000 ft. over Moses Point.” It's clearer at Nome. I see clouds stream and above, still all white below. Gradually, gradually the white dissipates. A pale streak of blue sky shows, off up high. There's texture in the white below—mostly long, smoothed shapes of white.

4:51. We'll be in Nome in 20 minutes. Gray decks ahead. Jim used to run a leather shop in Santa Cruz.

I see land below, rounded hills bloom with snow black in the canyons. A stream now, bars, forested slopes. We're not on the tundra yet. The trees are in the canyons and the hills bald. I can see the Bering Sea under the cloud deck now off to the left.

Braided blue river banked with rich brown and a liner of white at the water's edge. Tundra ponds peppered across the brown. Oxbows and bars, like out of a text book.

"Go to Bering Air? Is that OK?" Jim asks. "They're the most colorful one. I used to work for them."

"OK. Can we get a taxi?"

"Yup."

The land is wrinkled and etched into families of parallel lines by the snow. I wonder what earth process did that?

We pass Council and head along the bluffed coast, sand beaches and now coastal lagoons we can look up ahead and see the barrier bar and the big lagoon at Nome.

Pt. Safety and Nome straight ahead. A dark, flat-topped island lies offshore. Somewhere out there is St. Lawrence Island to the WSW.

The inland mountains of Beringia are on our left, snow-decked and apricot in the afternoon light, their heads nudging a skin of clouds. The sea is government-issue green. The tundra ponds are banded in lovely rich yellows and browns.

Do I see belugas below? I think so, lying like white sausages, helter skelter every which way, not far off shore.

We can see the road across to Teller now, ducking up a broad glacial valley toward the snowy peaks, a winding stream in its bottom.

I see a gold dredge sitting like a giant duck in its little made-up pond, gray spoil behind it, wandering over the tundra flat.

We circle out over the Bering Sea (Norton Sound) to land, gray, white-capped, foam trails away from the wind. The sea is dark greenish gray—no transparency at all.

Then Nome, a wedge of buildings, white tanks, red, blue, tan roofs, a rock jetty, and some landing barges perhaps abandoned, 4-5 dozen private planes are tied down on the gravel. Cranes, light towers, hangars, a partially paved runway. Offshore we can see Sledge Island, that looks like a volcanic, flat-topped sea mount—but a lot of these islands look that way and it may be glacial or even interglacial. I dunno.

We went into Bering Air Service and called a taxi—an orange van with a great, mountainous, impassive, fur-clad, mustached Eskimo riding shotgun.

The Nome Nugget Hotel is on the main drag as you turn into town. It is on the water. Fat Freddie's is the restaurant—and it is a mass of gold rush and other artifacts, gold pans, old newspapers, dredge scoops, kayaks, polar bear rugs, etc. The rooms are small, clean. We have a shower and can look out over the Bering Sea. It's bleak out there, dark green, and rather calm, though streaked with wind.

We walked the length of town. Old, scruffy buildings sinking into the muskeg alternate with a new town hall, an armory, a kind of mall, a northern brand of U. Alaska, really devoted to education of the local people. We went inside and talked to the science-math instructor and Ev looked at their terminals.

We had an Italian dinner—frozen veal scallopini and spags, and a couple of glasses of wine. I called home (all's well). Now 10 PM, it's getting pretty dark and we have quit for the day. Tomorrow we rent a car and head up the Teller Road. Maybe Lloyd Lowry will come in in the afternoon and maybe not, but we have to leave the following morning.

My camera, which had been in the nose of the charter plane, refused to function because its batteries were cold. So, I'm warming it.
Off to a shower and bed.

September 18, 1992

Nome, Alaska

Ev and I have boarded an Aerocommander with Lloyd Lowry and Dave Weintraub pilot to do a spotting flight for belukhas along the north shore of Norton Sound, into Norton Bay and S. to about Unalaklec and return. We have more than 20 kts. of wind on the sound so it will be difficult spotting.

We arc on the tundra, the big placer dredges and out south to the shoreline. The Aerocommander leaps off the runway. We pass along the shore and the Eskimo summer cabins. [?] is the name of the game, both in Nome and on the beach. We fly a ½ mile off the beach at 1,000 ft. We pass Cape Nome—a quarry site used here and at the Pribilofs. Now we pass Safety Lagoon. John Bockstoce has a house here. He built his Umiak here.

Safety Lagoon is a mix of skim ice, open water, and snow margins, and behind tundra of blueberries and willows and alders.

In spite of wind our flight is not much bumpier than a good dirt road.

We go by a murre and killiwakes. We pass Table Rock, the low hills have snow-dusted bald tops where the weather has stripped the land.

Saffron cod are incredibly abundant here.

We pass Golovin Bay, a [?] dotted with largha seals (spotted seals). It breeds on ice, close to leopard seal.

The coast becomes more precipitous and behind is a big, deep bay—Golovan Bay.

We fly over the village at Golovan Bay on a spit that blocks the lovely bay. Lloyd says they hunt a few belugas. They are mostly reindeer herders.

The muddy plume of the [?] bay is below us, marked by foam line from clearer greener water.

Seems like 5,500-6,000 belugas (Spring-June). We pass Cape Darby. Walruses haul out here. Males. We move into Norton Bay. there are two villages in the bay, Elam and Koyak—the latter back up the bay. We cross the tree line. Here comes the spruce forest, white spruce, and perhaps willow.

The belugas concentrate on the coast so the offshore lines are apt to be [?] except in ice time.

Lloyd thinks belugas have extreme site fidelity, and come back and back. What makes them attractive is—what?

We pass Elam—150 people, and an airstrip, mountains behind. this is a shorefast ice. Good [?] seals are in the winter. Good place for [?] dens.

Bald Head looms. The bay turns muddy. Kwik River, a broad-winding river, ice-margined, shallow mud bars.

Bald Head abeam. The water clears and deepens a bit. Granite Mt. Deep in snow to the north.

Dave says a big gold mine is up there. We come up on Koyuk, a beluga-hunting village on the big Koyuk River—big, broad, muddy, icy. Not a rich area because shorefast ice anchors to the bottom. Finely penciled foam streaks line the water.

The ice locks to the shore, over the mud. It's 500-m wide here. Thermokarst ponds, a piece of ice in the sediments melted out leaving a roundish pond. The flats are dotted with them. It's getting muddier and muddier.

We pass over Shaktoolik on a bar—a beluga-hunting village on the ocean edge on a giant flat below the distant, snow-frosted hills. We pass a gleaming gold bluff, like mica, or gold.

"Dependent independence." that's what John Burns calls these Eskimo homelands. What the northern people seek.

We come upon Unalkeet, the Unalkeet River is very good king salmon fishing. A real metropolis amidst snowy hills at the mouth of a river. About the size of Nome, I guess.

We turn out across Norton Sound and head directly for Nome about an hour away. The sea is dappled with tumbling white caps and low swell. There's little fetch with this wind so oceanic rollers weren't here. Cloud shadows on the sea made gold by the low sun.

Lloyd has kept us informed all the way along. He knows this place, as does Dave the pilot. There are whales here somewhere over this shallow sea and an enormous area to search for food. So where are they?

Fine flight. We settle in over the airport and stop 50 yards short of end of the pavement.

The last time they found the whales they were off the Yukon Delta, which we did not reach—part in brown and part in the green water, scattered across some miles of sea.

Why do they school together? They have such a rich acoustic system, one wonders if they have some group process as protection from killer whales or other predators. I heard a little mention of a group action against polar bears. Any animal that makes such an enormous amount of noise as a beluga automatically advertises itself. So its protection lies elsewhere. Polar bears, to be sure, may not hear well underwater, but killer whales do. White whales fear killers and run from them—a group-dwelling predator against group [?], so there must be failure by the belugas, at least sometimes. Sometimes is enough. But they . . .

I take a break to hold Samuel's saline solution, an Eskimo guy going to Humana Hospital in Anchorage. He's a old guy with some senior's problem going in for treatment. He tells us he is a welder and that where he worked is too cold—up between Barrow and Deadhorse. He looks a little jaundiced. He says he can climb into the plane . . .

But they seem to deal with bears. Gang up, I'm told. But they are killed sometimes, too. Knowing would unfold a fascinating story, I think. We know so little about what belugas are really like. We know numbers. The specifics of hunting, the outlines of population dynamics, but of their behavior—very little. People think they know belugas. They don't at all. The trainers know best.

All this was in the afternoon. In the morning, Ev and I rented a car from the Polaris Hotel. Go in past the laundromat signs, turn left through the door saying "No Admittance" and enter an office where you rent the car.

We unfolded our Geological Survey Quadrangle maps and headed up the Nome River into the rounded, tundra-covered hills, the higher very bald and dusted with snow.

Our road led toward Salmon Lake and was an elegant gravel one—a berm piled. The slopes are gold with low willows, only a few reaching a meter and a half high. Most

of the slopes up to the barren ground and snow were rose with low-growing blueberries in full, ripe fruit.

I stained my pants lying down to take a picture up into a bleak, windswept canyon.

A few dozen shacks dotted the landscape and a system of flumes, now abandoned lead along the west slope, going, I suppose, out to the flats above Nome to provide water for the dredge to swim in. Down the canyon purred a river, the Nome River, 50 yards across, purling over stones and often enough margined with an ice rime.

On up we went until the snow blanketed the hills almost to the valley floor. There we met a slope flanked with dark alders, four- to five-ft. high. One could see the solifluction lines in the trees, but much better over more sparsely vegetated slopes. It is lined more or less along contours—a soil crack propelled by ice freezing and thawing, whose lines drip and move down hill slopes.

We came to Salmon Lake—water in the valley bottom, pale blue, low, vegetated slopes and hills beyond. The wind shipped unmercifully and was very cold. We went in an abandoned miner's shack—30 years old, maybe—flapping tin, bedsprings, an old bicycle, a distributor cap, tarred seams, single plywood not much more than head high. A bleak two rooms and an entry. Cold, bleak, elemental.

We returned for the afternoon flight and had 30 minutes to spare.

That night, after the flight, we had dinner at Bob Nelson's house. I liked him a lot. He's married to a Shismaref Eskimo woman, Mal—as nice as she could be.

We went up the back street of Nome past churches. I'll bet there are 10 or more kinds in town. Bob's house is rather new, up on permafrost piles (they lift the houses above the ground so it doesn't thaw and do in the foundations and tear the house apart as it sags and sinks).

We had red salmon and a good bit of wine and fine conversation with Lloyd and Dave, the pilot. The Nelsons have bought a small coffee plantation near Captain Cook and they will retire there in a couple of years. I want to send them a spinner book.

About 10 we drove back to the Golden Nugget, showered, and got ready for tomorrow's trip. Ev had to see the Board of Trade, the local bar of wildest repute—a few doors down. It has an electric light show dance floor, "Sin City" was playing loud, synthesizer drums and guitar and a few Eskimos dancing up a storm. Ev and I had a couple of rums, played bingo—or scratcher—and he won \$20 and me \$4. We watched the pool (not very good) and hit the hay.

But to little avail. For the second night in a row the paper-thin walls let us in on a bachanal next door. An Eskimo woman, drunk but coherent: "Fuck you, Fuck me, bang, thump, but only once, and low male voices of no passion, a child's wail, more from the woman, and on and on for hours."

I pondered pounding on the wall but thought better of it. I didn't want them pounding on our door. Finally, after midnight sometime it subsided. We're both a little the loss for wear today for lack of good sleep.

We board Alaska Airlines very nice DeHaviland commuter plane and head over the clouds for Kotzebue on the Kobuk.

We landed, coming out of the clouds over the nearly flat Beaufort Sea, the sun low and copper, the snowy hills low and rounded, great shallow lagoons and flats inland—all pale blue, brown, gold, with white, white, planed-down mountains behind. The town is pretty big and rather neat, compared to home. The light was coppery—the sun low. Once out of the plane the cold wind cut in. We headed for the warm terminal.

Our plane was having trouble in Anchorage and so we waited. Ev and I walked into town in search of a restaurant—the first was Chinese and not really ready for patrons. The second was unmarked, a great three-story facing the flat sound. Kittiwakes flew by and some glaucous gulls. We are quite a bit above the Arctic Circle here and it feels it.

We had an ample breakfast looking out the window past the bowhead bones on the esplanade—pickups everywhere. We hitched a ride, three of us, from a gracious Eskimo girl. She dumped Ev and me off and we went in and boarded soon after in a big jet.

Soon, Anchorage, a long wait. Roger Genny walked by and we had a fine chat. Then off for Chicago. No serious hitches yet, except I left my long johns inside a pack that I used as a spare pillow to cushion my sore shoulder. A guy ran into the Nome terminal with it—praises be, so I don't have to buy more long johns.

Now comes the long (six hours) flight to Chicago.

Gasp. We're in Toronto heading for Montreal. Both Ev and I are zombies. We'll hope to meet Bob at the airport, but if not he has the hotel name.

We fly over the Great Lakes. I wonder what it's like to own an island, if we can meet Bob easily, and then Moosemeat. Bob comes in at 5:19. Ev is up straightening out his return ticket and once that is done we can head for the hotel.

A good night's sleep will help and then we go out tomorrow at . . .

Baffin Island--Iqaluit

September 20, 1992

Canada, Montreal

We did meet Bob OK, had a grand horsemeat, Caesar salad, cheesecake dinner, and then up this morning to meet Danny, who had driven taxis for 48 years.

He drove Hudson Terraplains, Packards, etc., married 47 years, he seemed to think this was a Catholic attribute. All us non-Catholics nearly equaled him, however. Now we wait for the Iqaluit flight. The weather is balmy here but we hear of snow at Iqaluit, -4 degrees C. at Resolute.

Kenny Bloome came in on schedule so we headed for the Frobisher Inn—a great condo project six stories tall with perhaps 100 rooms set aside for a hotel and with a fine restaurant downstairs.

I contracted with a tour guide, Matty McNair, to take us around the local area and show us the sights. Matty proved to be an ebullient young woman, a teacher, a real Arctic buff, a runner of dog teams, and general tour guide to the area. We saw Iqaluit (pronounced Ikaluit), its stores and sights. Its buildings, dirt roads, squatters on the beach, dogs staked out among the kelp. The tide is over 40 ft. here and this makes the harbor of only modest use (they run in with tankers, pump hard, and get out before the tide drops them on the flat). The result is poor supply for the town, except by air. They wait for lumber, etc.

We had a great first dinner (Arctic char) overlooking the harbor, the fuel tanks, the cemetery (We looked for plants there). Good white wine, Arctic char, and company. It's a grand crew. I'll say more later. Now it's the Giants and Bears on TV. Moose is in the shower, and it's 9 PM.

We watch the NY Giants and Chicago Bears on TV. The Giants take 'em easily.

September 21, 1992
Baffin Island, Iqaliut

Iqaliut is a collection of about 3,300 people, living along Frobisher Bay, a long cut in the southeast coast of Baffin Island. It's here because of the need for refueling for the WWII, so it had little to do with natural resources or even how you can service it by sea. It still shows. The Inuits make their camps where one or another resource is available, often seasonally.

So these military, mining, or weather-station towns are always dislocating for the native people who must live in them.

The area has much exposed bedrock but even so the houses and buildings are on pilings, allowing air circulation underneath and preventing melting from occurring, the cause of houses going all out of true and sometimes destroying themselves as they sag and slump.

There is a trim, prestressed concrete school, in full swing with two dozen kids kicking balls and squealing away. There are barges stranded in the harbor now as the tide recedes and a pickup has driven out on what was once the harbor bottom. The bigger fishing vessels are way out, a mile further.

We hiked in Sylvia Grinnell Park looking at plants in the low vegetation—much *Selaginella*, lichens of various sorts, *Ledum* (Labrador tea), *Draba*, a *Pyrola*, three or four willows, a *Ranunculus*, Arctic poppy, and some others. We visited the cemetery down in a gravel outwash plain above tide line—all crosses of wood, plastic flowers, and wreaths.

September 22, 1992
Canada, Baffin Island, Iqaluit

We got up, had breakfast, and I stayed in the Frobisher Inn—nice rooms, a big institutional building, three or four floors, half apartments for rent, the rest hotel rooms. There is a good dining room, a little pricy, but good food. The others went around town while I got my accounts straight—receipts, etc., and then we walked around town looking for muktuk for me to taste.

We found a fishery sales building—a Scandinavian-looking guy who said mostly he sold locally. He had some Arctic char—big, beautiful, red-spotted fish, like huge brook trout. He had some narwhal muktuk in squares about 10 in. on a side, mottled skin showing. I didn't buy any. The man said most of their catch was *Mallotus*, or a couple of kinds of Arctic flat fish, molas, wolf eels, zoarcid eels, enchalon.

It had begun snowing fairly briskly. The lady at the hotel counter said, "Oh, that's all right." They seem not to worry about a snow like this one, and apparently winds are more likely to stop them.

The others have walked uptown while I stay with gear and nurse a headache—too much gaiety at last night's dinner. The plane has been delayed until about 5 PM.

Then, with luck, out across Baffin Bay to Nuuk.

The Naarwhal came in from up north, not so often around here so we were told—Grisc Fjord.

Lots of children and many young women with babies, often in parkas carried in a sack on their mothers backs over the long apron-like affair that hangs down in back further than the front. So we were told it's not much of a sin to have babies out of wedlock and population increase is among the highest in the world—over 3%.

So welfarism is here with its consequent release of population numbers, and very little pressure base to support it. Housing here is very dear. One hundred and thirty

thousand for a very small frame house. Many use subsidized housing. So it's hard to see how it all can be sustained, and at the bottom of the pyramid, the wildlife including the beluga.

Musk ox and reindeer farming may help some, mineral extraction a bit more, but in the last analysis the place cannot accommodate the flood of new people except by welfare for very long.

TV enters. Everyone watches the game shows, the ball games, the world news. For the first time they are connected to the rest of the world. They enter the 20th Century, ready or not. The land and its life, harsh and resistant, or naïve and vulnerable are swept along too.

September 23, 1992
Muuk, Greenland

We made our way down to the airport through an increasingly heavy snowfall. I couldn't imagine that First Air would fly in this stuff, but I asked the girl at the counter, and she said "First Air? Oh, sure," as if nothing like this little storm, where you couldn't see across the runway, would stop them. It didn't either, and it didn't let up.

But after looking over the art warehouse where the owner, a big fat guy, said, "Bring your gold cards," we went aboard a [?] (prop jet), about 20 of us, and we raced into the sky, up through a cloud deck and on over the invisible Baffin Bay to Nuuk, Greenland. A bit over two hours later we dropped down and soon could see the land without snow, long fingers of land and channels of the sea with craggy snow-dusted mountains behind, disappearing up into the clouds. The lights of the town were gleaming as we landed and soon enough we were in town.

It is very Danish—spotlessly clean and with strong colors on the simple buildings—many long row houses of 2-4 stories. The Hotel Hans Eede is spotless, very well appointed, smart Danish furniture, solid smart fixtures in the bath, fluffy down comforters, house plants, all carpeted, a big dining room overlooking the town.

Nuuk itself, 13,000 people, has a buzz of traffic, including busses and a good many taxis. We walked the square, past banks, to a convenience store with everything from licorice whips to social tea biscuits. The proprietor is very Danish, while Anna, the smiley house lady in the hotel is from the Faroes.

The spaces between stores and banks are often paved with interlocking bricks and walkways of asphalt. The people are either Scandinavian or Inuit, or often enough, a combination. Truly Inuit people are maybe 1/3 of the pedestrians. A skateboarder rocketed over the cobbles and a cat meowed.

We straightened out our tickets—mine hadn't been reconfirmed so I was dropped from the manifest. The travel agent, Mary Ann, part Inuit, had spent a year in Santa Cruz, fixed things up even though I was on stand-by.

We contemplated renting a helicopter but it had to dead head from Illulisat and would have cost \$10,000, so we decided to try a boat instead, out of Illulisat for \$2,000. Better anyhow.

But the weather closed in and we are back in Nuuk since high winds are predicted and the plane to Illulisat won't fly.

And they came. We went off to the Icelandic Restaurant—"Exquisite cuisine in a delightful ambiance"—tux-clad waiters abound. Imagine your agent getting you a gig in Greenland.

We had an elegant dinner—reindeer, I had whale steak, red fish. My whale was fried with onions, huge (two times as much as I could eat), very beef-like in color, brussel sprouts from Santa Cruz (I guess), and then back to the hotel through the wind, which had picked up a great deal.

I can see why we didn't fly. We will make it to Illulissat tomorrow and a plane goes to Uummannaq on the 25th. Now to see if we can charter a boat to sail back to Illulissat. The air charter cost \$10,000 or a bit more and I begged off.

Well, off to bed in our ever-so-elegant feather beds.

September 24, 1992

Greenland, Nuuk Airport

Well, we're giving it another try. I stewed about everything last night and came to the conclusion as the storm raged outside, that it was impractical to go to Uummannaq since we couldn't get back easily and our schedule out of Nuuk is frozen.

I had bestirred myself yesterday and gone over to the Department of Fisheries and Industry to look up two people recommended to me by [?]-Peter Heidi Jorgensen—one was gone and Amalie Jessen was about to go home. Small, almost furtive, black eyes, expressionless mask of a face, she told me she was going home and couldn't talk. I told her I was coming back next week. My personal introduction was good enough for her to learn more than that I was writing about the white whale. I told her I would be back later to check in.

The result was that this morning in the lobby of the hotel, a great impressive deputation. Dennis Sandberg, Deputy Chief of Mission, US Embassy, Copenhagen—a huge, bluff man, and Jens Paulsen, Einor Lemche, Amalie Jessen.

It was very "high noonish." I told them my mission and there were questions such as "Do you know about the joint Canada-Greenland beluga commission?" I did, but not deeply enough? Had I seen [?] Peter Heidi Jorgensen's papers, which contained it all.

"Yes, I had them, but wasn't it true that statistics on the catch hadn't been turned in since 1989?"

"Well, yes."

We left it pretty much at that with me telling them I wanted to know about population increases in Greenland and that I would return.

We parted in good form, I thought.

Now we are at the airport waiting to see if the plane will fly in this windy weather. It whips down off the bleak snow-dusted mountain and blows the rain pools this way and that. Now and then a shower comes and is also blown about.

We collected rocks from around the airport, which are, Gustav tells me, 3.76 billion years old—the oldest dated rocks on earth. They are gneisses, granites, with amphibolite inclusions.

So, will be off to Illulissat, maybe.

50,000 people in Greenland. AIDS is here, 25-30 cases in all of Greenland, and 15,000 tests a year.

We sat all afternoon at the airport while the wind howled and it rained or sleeted. We were supposed to board at 1412, and that was passed up and then it became apparent that there was a mechanical problem—a landing guidance system problem—many delays. Finally, they unloaded a stretcher-born person and began to unhitch blowers and things.

There were some grand people that we became acquainted with—a woman vet in charge of the subsistence animal industries in Greenland, just out of Denmark; a Norwegian doctor in charge of communicable diseases, and a northern Inuit fellow with green eyes who told us he had come from Tule, way up in the north and got a job at Ummannak way to the south and didn't want to leave his dog team, so he drove it all the way down across Melville Sound and on, stopping at the Inuit villages and to Ummannak where he is now a construction supervisor for Home Rule Housing.

He did this enormous trek alone, just he and his dogs. Mostly he fed them fish. And he had done the trip three times since—an odyssey of maybe 1,000 miles. I wonder how many such odysseys of necessity we never hear about.

The Doc said AIDS was under control but other problems such as TB were rising.

The Home Rule group met with us for dinner and we discussed monetary dynamics and Greenland. Tomorrow we try again. Ken and Ev have gone off to the Seaman's home for a \$40 room. The weather is clearing. Now if the plane works. We leave at 8 AM.

It occurred to me that these people, the Inuits, have been a part of the Arctic ecosystem where the rules are simple and [?] whatever you can to sustain your population.

And now, by adopting crucial parts of a foreign cultural system that has almost totally escaped into a new systemic relationship to the earth and its life—the welfare, the commerce, the health systems, the value structure, they are now outside the belukha's world and they hardly realize it. The relationship cannot be supported if these new people with new support systems regard the beluga as they once did.

The give and take is no longer anywhere near in balance and destruction of the less-equipped partner is inevitable unless checked by cultural adjustments derived from the adopted culture.

While having dinner Moose reminded me of some extra things about the Inuit Odyssey I described earlier. The man—about 40 I'd say—had told the home rule people he wanted to bring his dogs. He said he told them he would be there in three months because he was going to drive his dogs. He also mentioned his pleasure at having an air mattress to sit on and mentioned that, "you could also sleep on it." Such a revelation. Going across Melville Bay he stayed near shore, which got him into "screw ice," which because of ice movement builds up around rocks. He did it all alone, and it must be 800 miles in mid-winter.

September 25, 1992

Ilulissat, Greenland

We were up early. Actually I was restless and up at 3 AM or so, and fitfully back to bed. It had calmed and the snow melted until toward dawn, when it came again.

We piled down to breakfast (Bob and I)—Moose and Evan were at the Seaman's Home, and then into a cab on the now snowy, icy streets and up the rocky hill toward the airport, which is hacked out of the hillside, and is a very windy place, but at least the wind blows preponderantly down the runway. Our driver skillfully took us up over the slick, snowy road and rather soon we were on board in the dancing, moving plane.

The sky was white and opaque until about Sondre Stromfjord, where we landed up a great glacial river valley. The huge U.S. field and the SAS strip were on opposite sides. Though the US flag still flies and some of our planes were there, we are told it reverts to the Danes at the end of this month.

The loess from glacial flour in the braided stream bottom had been piled by the wind against the canyon walls in places, and Bob tells me that dust storms of monumental proportions can result.

The SAS terminal here was crowded with travelers, knick-knack stores, glass, baggage racks, etc. It's hard to realize that outside just a smile or two up the fjord valley lies the great ice shield of Greenland stretching interminably on to the opposite coast.

The clouds seemed to lie flat over it, forcing perspective as the bulge of ice rose and curved and disappeared.

We photographed the inevitable, radial pointer pole telling how far it is to Rome or Taipei or wherever. We were first in line back on board our Hawker Siddley to head north to Disko Bay. My seat faced the center of Greenland, so I could look up the [?] to the ice shield and look back toward the low sun over the rounded rock of the mountains at the gleaming tarn lakes collected in rock depressions. When the gneiss itself wasn't exposed the rock was skinned with rose-red—from *Vaccinium* bushes, I'd guess, or splotches of topaz yellow and tan.

The ice shield swelled down canyons, became fissured by systems of cracks at right angles to the flow, and then ended in a jumble of ice over sediment-choked valleys.

Moraines weren't very much in evidence. I think the smooth rock mountains have been picked clean and the ice mostly slides down slick rock canyons, polished like glass.

We slipped out over Disko Bay just north of the Arctic Circle and headed up the east shore and as we dropped down for a landing at Ilulissat, we passed close over a 1½-mile-wide fjord choked with a jumble of ice blocks, so thick little water could be seen except at the entrance where icebergs as big as Radio City stood like white castles, immobile, so far as we could see, in the quiet ocean.

We circled in over the village and then the crowded harbor down in the rocky cleft of a fjord and onto the runway. We were met by a bright young woman driving a Hotel Arctic van and taken to the nearby hostelry high on a ridge of rock overlooking the harbor, town, and fjord. Contrary to advertising, it was not the optimum place for looking at icebergs, the best being in the town itself, which edges onto the ice fjord.

Soon we found that our delay at Nuuk had put us on the Arctic waiting list and there were no rooms, so off we went by van down into Ilulissat—¾ mile away, or so.

We were directed into the Hotel Juide Falk, which has two fine white falcons over the door. This place is right at the entrance to the fjord and one sees icebergs moving past the big plate windows from the excellent dining room.

The day was sunny and bright so the glaring white of ice contrasted to the deep blue ice interior as they drifted by. We had an elegant lunch—crystal, folded napkins of wine color, silverware, and tablecloths—and thence out for a walk around town. It's a marvelous, busy, dog-filled place of trim, vari-colored houses, sharp sloping roofs, vivid red, blue, and white walls. Most houses are built on exposed rock. Often a big concrete wall defines a basement, and then the house above. Triple-glazed windows, heavy doors, vestibules, a spired church down above the ice fjord, the Knud Rasmussen Museum, an old sod house, a three-parted [?] works of three vats, an arch of bowhead bones, and dogs, dogs, dogs. They are little, light, almost coyote-like, pale dogs, mostly chained in fields or up on the rocks. They sit or sleep and wait for winter when they can run and pull for eight hours at a stretch. They got into howling contests and sang back and forth. Usually there was a sled or a Comatik nearby and a fish-drying rack, often festooned with shingled rows of northern halibut.

Downtown there are stores, bars (where beer can be had, or hard liquor, but it's very dear). Bob and I wandered down into the cleft-walled harbor, the busiest place in town. A raft of small boats clustered on their moorings deep in the harbor and out beyond. The big coastal ferry was moored at a dock—I'd guess it at 200 ft. long and 35 ft. high at the waterline—bright red and immaculate, Inuit people waving from the railings.

Forklifts and trucks raced about—a true and constant hazard for the wandering visitors to the dock.

In between, fishermen patched drag nets and balloon trawls; others adjusted chain lines and doors to trawls or lashed floats on the upper throat of nets.

There was an ancient, very, very battered Russian stern trawler, long-haired Russian crew hanging cigarettes over the rail. I wondered what life as such a crew was like.

The catch was ground fish—halibuts, wolf eels, shrimp (a big deal here). Bob and I escaped not being run over and headed back for town. We met Evan and Moose, who are holed up over a bar and full of joy, near as I can tell. It looks like snow is coming though it's been a bright, sunshiny day.

September 26, 1992

Ilulissat, Greenland

It snowed last night, and we have the tail end of the overcast now. Icebergs have crowded into the harbor mouth so deeply I wonder if boats can get in and out. What a curious place for a harbor.

Twenty million tons of ice go by every day from the ice fjord, and it must block up constantly. But it is beautiful. (The reason is that it is an especially productive fishing area.)

The battered Russian trawler tried to come out and ran into a berg almost as high as its bow (20 ft. or more) and there was a cascade of shattered ice, but the big trawler stopped and pushed a while. No dice. They backed up and tried to go around. Still, no dice. (There were big rust trails up the berg.)

I stayed in the warmth of the Hvide Falk this morning and wrote, did accounts, etc. I prepared my views on the beluga problem for the Director of Home Rule, found him downstairs, and gave it to him.

I asked for some materials for the story—demography, etc.—and told them Mads Peter Heide Jorgensen's work deserved support, and that I didn't know him. Nosy! Why not? I didn't like some of what I heard (if a human constituency yelled louder, they might deserve a larger kill, or quota).

The Director, Eniar Lemche, is a big, blocky guy, obviously very smart and penetrating.

He will, I think refer my wisdom to Amalie Jessen. I don't expect much. I told them that it looked to me like the present Greenland belukha kill was twice as high as could be sustained and that selling mattack (bluber and skin) just locked the animals and the hunters in an unsustainable commerce. Well, why not? They know I'm writing a story for *National Geographic*.

This afternoon, Ev and I walked out past the heliport, past a big field where dozens of dogs were chained and waited to be fed—mostly the remains of Arctic halibut minus the fillets. Then past the cemetery—bleak in the snow, a tight little plot of wooden crosses decorated with sodden paper flowers, up in a snowy cove in the rounded gneiss.

We slogged on, picking our way up toward a rock cairn on a hill overlooking the ice fjord.

Bob, Kenny, and Ev had previously blazed the trail. Dog music was everywhere. We picked our way up amid sedges, prostrate willows, cotton grass, blueberries, and lichens.

A black lichen predominated, punctuated here and there by rings of gold stars—another yellow lichen. In the rocks were pools and it was easy to break through the ice crust and sink into them. Caution, caution, no wet feet please! One pool, larger than the rest, had an ice skin except where protuberant rocks kept thawed circles open—very elegant. Finally we reached the crest and could look over at the ice-choked fjord . . . a parade of huge ice ships making their way in succession out to sea. The big ones were 120 ft. high and 1,200 ft. deep. Imagine that! What huge shapes. These big ones may plow the Disko Bay bottom as they sail, twist, and steer, and unless they go hard aground, they sail off. A dozen pure white shapes—vertical walled, some with fluted peaks, some flat on top, sailed along, the Disko Island in the background.

The low sun is pale copper, the high sun clear blue. Colors appear on the bergs, pale pink on top, deep rich blue in crevices, and at sunset some off our hotel were almost lemon yellow, perhaps from reflection of the town's houses—I don't know.

The town is full of kids, [?] bundled up, and rosy cheeked. Lifespan has doubled here since 1951—32 years for boys, 37½ for girls to about 60 now. The row house out my window is lined with [?] and sleds careen down the streets. Slick, slick, dangerous, but the locals seem to pay it no heed at all.

My impression is of a truly serious population spurt here. The kids (and many adults) are quite beautiful people, mixed as they are between Nordic and Inuit ancestry.

We were invited to a dinner to be held at the Hotel Arctic. There was to be native dancing and the Vice Consul Dennis Sandberg and Director of Home Rule Lemche were to be there with Roberta Sandberg, as well as two groups of businessmen from Denmark. So I decided to take my team. We had a Greenland plate, which included a lot of local food in tiny samples: mattak from a beluga, dried cod, herring, lumpfish roe, salmon, and reindeer jerky. The mattak was tough as my boot sole, rather flavorless and oily, not something I'd go very far for—fainly nutty in flavor. After that, musk ox steak—rather coarse but good. I thought it would make fine pot roasts.

The Eskimo (Inuit) dancers were a real surprise—it was to polkas, or square dances, and I could recognize the tune of "Little Brown Jug."

I was told by one person the music came from the Dutch, and another from the Scotch. I know the Scotch were here.

We talked to the Lemche/Sandberg party quite a lot. Lemche—he is a lawyer and began to work in home rule issues. He's been here a while, maybe a decade—very bright and subtle. He went into a long conversation directed at identifying who I was and what my views were. This, I believe, was directed at seeing if I was an activist, especially Greenpeace, who are reviled here as knowing nothing of the needs of the people. I thought he warmed noticeably after our initial contact. I didn't press him.

September 27, 1992

Greenland, Ilulissat

We take a boat ride today. We were met at the hotel by the van and taken down the icy hill to the dock by Flemming Nicholsson. The boat, the *Nika*, is a little fishing boat of about 37 ft., made in Denmark in 1956, diesel powered, a bit battered, but smooth

running. Capt. Thorvald Jensen—pale and peering over [?] glasses, blue-eyed, a nordic, “square” head with a fringe of red hair and bald pate, squat, with a remarkable twinkle in his eye and sense of the absurd.

He handled the boat alone. We clambered over the bow into the forward deck where the winch, stack, and spare ancient stock anchor were located.

Coffee, tea, and sugar were available and Ev had brought along a loaf of bread, so no problems about food.

We edged out of the harbor with Capt. Jensen plotting course on a satellite positioning rig, combined with fathometer. He sat perched on a high swivel seat in front of tight rectangular windows.

The head was located on the stern bulkhead of the bridge and the galley below. The day was still clear and bright, cold but not seriously so.

He headed the vessel right into the glacier field from Isfjord—choked with colossal ice castles, some looming 150 ft. high. Since they go down about 10x as far as up, that’s a huge hunk of ice. Some were acres in extent. Their walls were glazed like nubbly, irregular porcelain, pure white except where cracks had healed blue—the difference in color is in air content of the ice—white with air, blue congealed and vitreous. Some bergs were sheer-walled and craggy, others sloping up from the water. The waves had marked an indented ring just above the sea, and doubtless when these bergs grow older it would cut in and deepen.

These huge jelled islands were moving of course from water movements around them and from the ice moving into the sea from behind, so to go down the sea corridors between them was a subject for caution. Capt. Jensen replied to my question about danger. He said they would tip, but slowly, with much sound, and providing you had some place to go, these tipping events were slow enough to be evaded.

Skiffs and small gill netters patrolled these channels—the first one seal hunting—ring and harp seals.

Jensen avoided talk about harp seals, I suppose because he was uncertain whether or not I was “Greenpeace,” which is anathema up here. They fish here in the ice, too. Jensen said the town was here because of the good fishing and sealing and worth dealing with ice in the harbor on a regular basis because of this.

Ravens flew and tumbled off the crests of bergs. They are amazing, adaptable birds! A few gulls went by.

We learned the fjord was 1,500 meters deep (Can this be real?)—not feet as I had supposed. He told us the upper ice fjord was a place where the ice was launched over water—some say it goes far back under the central ice shield inland.

The beauty of these immaculate chilly castles grasps one, tying your gaze to the varied forms before you.

Captain Jensen stopped to dipnet himself up two ice chests full of sea ice, which he will put in his whisky. It’s contained air crackles and snaps in his drink like carbonated water.

We were on our way again, I thought, to a village across the fjord channel called Clanshavn (Ilimanaq), but we turned north toward Rodeby (Oqaitsut), a village 3-5 miles or so north of Ilulissat. The bergs were spread, and the big ones mostly over toward Disko Island, so it was pretty clear sailing. Ev spotted the spouts of a whale, but we could not find it, and so continued along the coastal hills, scoured rounded rocks, and clefts dusted with snow.

Then we ducked in a channel blocked by two rocks awash at [?]. The captain hugged the right cliffed channel wall so closely we could almost touch it. Past the rocks we turned into a still bay and beheld the village of Rodeby—maybe 85 Inuits lived there—fishing, sealing, and whaling people.

The town of scattered houses rests on a sloping, gneissic hill, polished and striated by ice. The houses are built on the bedrock, a wall of concrete on the rock to level and then a trim house, usually rectangular sloping roofs, wood siding, often tar-paper roofs, metal sheds, wooden or gravel walkways that now and then gave out, a little store, and a fine collection of dogs singing their greeting with barks and yelps.

Later when their masters brought food they stood on hind legs at the end of their chains pawing the air and singing in anticipation. A collection of wiggly puppies clustered around us, while older sled dogs, thin-faced, wolf-like, but too small, usually tan or off-white, without pattern, small hunter's eyes.

Torvald had told us about the Spanish Embassy, a blue building on the sloping rocks, a sign was bolted to it proclaiming it to be the Spanish Chancery (it said "Embajada de Espana, Chanceleria Honario, El pobles, Lunes, Viernes, de 9a 14h"), obviously lifted and brought home. The little dock, store, Greenland and Danish flag flying, the snow-dusted rocks, the yellow frozen ice and dog droppings, the fish racks with dogs resting beneath.

A small boat came in with a young man at the helm, pipe clutched in his teeth and a very handsome, dark-haired young woman in the boat. They were greeted by the dog chorus. They began to throw gutted fish of a couple of species onto the shore rocks—a cod and some sort of bottom fish. They took very little notice of us although we clustered close to the boat. We were summer people or tourists, not yet so odious as to be a distinct pain, but I suspect the time is not far off.

Our party included Einar Lemche, the director of Greenland Home Rule and Dennis Sandberg and his wife Roberta, Deputy Consul General of the U.S. Diplomatic Corps. for Greenland. Roberta is an artist, doing geometric acrylics, of which she gave us one, nicely inscribed.

As we walked gingerly downhill over the polished rock, I suddenly realized that the moment of action had come—the time for a true founding of La Cueva de la Topa Chisera. We had with us a man I had previously referred to as "God"—Einar Lemche, the ukimuk of Greenland, we were above the Arctic Circle, there were four founding members together—three geriatric cases and their doctor.

So I have my camera to God, we stood back on the lawn of the Spanish Embassy—at 69 degrees 17 min. north, as far north as we would go on this trip, and he took a group picture.

Ev spoke the imprimatur of the society as follows: LCDTS is devoted to the totally unrefined but deeply penetrating accessories of science.

It was a moment to remember—there under the low Arctic sun, on the polished rock amid the dog shit. We made our way back down to the boat past fish racks where Arctic halibut hung drying, down past the scattered houses, almost all silent and closed, some with Danish or Greenland flags flying, past the little red corrugated metal store, bags of potato chips and a stack of Hostess Twinkies showing through the window and back on board our boat.

We sailed out past the sloping smooth rock face where the Inuits mounted their hauled whales up for flensing—just inside the narrow rocky channel through which we

had entered. [Drawing] (I later, in Canada, learned that there had been a recent expedition to Greenland from Spain and doubtless they brought the sign.)

The boat squeezed through under Captain Jensen's skilled hand, just feet from the rock wall to our port. Then we made our way back to Ilulissat through calm seas. Both Evan and Roberta saw a minke whale blow.

We had a fine dinner at the Huide Falk Hotel with the Director and the Sandbergs. It emerged that Einar had been a representative to the IWC, and knew many of the figures in that curious organization whom I knew.

He very kindly took me aside to comment on my note to him. We were in substantial agreement on most points—the 4% annual exploitation figure, the need for quotas and more. He said he hadn't heard of any kill here of more than a few hundred animals. He didn't follow my analysis of the problem being underlain by population increases, saying that now they had quotas that should protect the animal. (I didn't know they did.) He felt that the society was reorganizing itself, and that self-regulation would produce a solution. We both agreed that self regulation was the best route, since there was little hope of any external policing. The Inuit would need to be educated on how many belugas they could safely take and then enforce the regulations themselves—the only thing that would work in my estimation, there being no enforcement arm here.

He knew Sidney Holt, said he was very clever, but agreed that the IWC would fall apart under the impact of his maneuverings.

Einar felt the kill of the northern population of belugas was not 2x what could be tolerated—but less. Say a thousand a year now from a population of 20,000—or 1/20—or 5% so, only modestly higher than could be tolerated if you don't account for animals shot and lost. Judging from the mayhem involved in a chase, I doubt very much if a 6-8% kill is far from the mark.

“Even though you are starving, you save the last seed till spring”—Ev's ethic of conservation of resources. Ah, but this is not agriculture. It is hunting and the game is to take what you can from the passing flood of animals because tomorrow they are all gone by and you must wait for them to return as the ice front thaws back again.

Now, as methods make the battle more and more unequal, the guns shot by hunters waiting on seaside rocks, or from boats, or the nets laid to entangle the fleeing animals, the balance is tipping beyond the gregarious beluga's ability to recoup and they must decline and become so scarce the game becomes no longer central to the people. Right now, beluga mattak is the most treasured food on the coast. The bowl of mattak empties first at their gatherings.

So, I think it likely that a decline in these whales may well be underway and may be rapid. It is heartening to learn that measures are underway to redress the imbalance. The means they must use involve a deep shift in the rules of Inuit society, and at the same time as these people come into 20th Century lives, with all the trappings of “civilized society.” Now they must somehow confront what that shift means. They must cope with discos, television, health care, food stamps, baseball, exotic foods, and all the rest. But the history of whales shows that the beluga can be expected to change but little. It will swim its old migration routes at the ice front though it must pass by rocky promontories and bays from which hunters will issue and where a white back exposed as a whale rises to breathe will be a target for a bullet that may kill, or merely wound, so an animal may later sink and not be counted. This is what they do, sink when mortally wounded. The time for retrieval is moments only and the water turbid.

We took a walk before lunch—up the icy streets, a big silver tank truck ground up the hill by us and a familiar figure waved in greeting. It was Torvald Jensen, driving the town “honey bucket” truck. Later, Dennis Sandberg labeled him as a fraud and found out somehow that he had been a primary school teacher. Dennis professed to be terrified by some of Torvald Jensen’s seamanship, though I could point no such finger. Dennis said our captain’s name was not really “Torvald,” which has connotations of nobility, but “Torgus,” a name of the common people. Oh, well. I thought he was grand, we didn’t run into anything, and the day was one to remember. Torvald lived on his boat, and I thought it could use a little dusting up, but the holding down of three jobs requires one to make compromises, doesn’t it?

We caught our plane after a long wait up at the airport. A helicopter (a big Sikorsky) left for Uumneang and then ours for Nuuk. It was a while before we were called out to board our Hawker. It was equipped with only about 20 seats and then ahead of us, a bare floor.

We swooped over the ice-choked bay and after a long while we came into Sondre Stromfjord on just about the last day of U.S. occupancy of the big airbase here. Then another wait in the SAS terminal and then on in the darkening sky toward Nuuk.

On the way in to Nuuk we saw our first aurora—a pale drapery, and later Bob and I saw a bit larger one in the dark sky in the late night.

September 29, 1992

Greenland, Nuuk

Today I’m scheduled to have a conversation over at the Home Rule office with Amalie and Jens Paulsen about the beluga and narwhal situation.

Statistics: Population young, 42% less than 25 years of age. Crude birth rate of the native population is 24.5/1,000. Life expectancy is 10 years below Danish, due to high infant mortality. 16,691 Inuit, 8,842 Danes.

First we tried to reconfirm our air tickets and couldn’t. You have to do that, remarkably enough, through Iqualuit. Then we headed for the bookstore, where I picked up a piece on the animal rights tangle.

Then I abandoned my pals and had a light lunch and then headed for the Home Rule office to meet Amalie Jessen about the white whale status and plans. I walked over and Amalie met me graciously and took me up to a conference room. Jens Paulsen, a biologist, came in. I asked if I could record the conversation. Amalie was agreeable but Jens demurred. So I tucked it away, knowing how incomplete the record would be. But, I did my best. Here’s what I learned:

In 1989 the first general meeting of the Joint Committee on the beluga and narwhal was held at Iquluit and the second in Ilulissat in January 1991.

The Joint Committee agreed to regulate the catches of these species. They agreed to begin by gathering catch data, while the catch-limit action is coming up.

Amalie is looking at the whole question of the technology of catch and its effects in society. One catch-limiting method is to restructure the use of larger vessels that can travel relatively great distances from port.

The population of Greenland is changing. The Danes are slowly moving out. The populations of the distant communities are either stable or going down. The life expectancy in Greenland is almost like in Europe now.

Paulsen sees gear as the problem. New equipment, such as faster, larger boats, nets, and rifles can be regulated and will control the kill.

The nation, he says, is obliged to cooperate on protection of species if “endangered.” I’m not sure what he means by endangered.

He sees following trends in the population of animals, rather than actual counts as the appropriate means of management. I’d agree, but also think attempts at making counts are important to give the outer boundaries of the required actions.

Amalie felt the first thing to do was to understand the traditional knowledge of the people. I suspect she is at least partly Inuit. A small, bright-eyed woman, she first impressed me as cold; now I see her as a little shy but very direct and honest. Not complicated, is my present guess.

There is a quota for fin and minke whales from IWC. Then in cooperation with community associations and local hunting and fishing organizations, they prepare a quota figure for a municipality.

But management can occur without quotas. Quotas require one to know population numbers and these may be all but unobtainable. The last method, Paulsen thinks, are quotas. He lists before quotas: gear, number of boats, size, persons who can hunt, and time of hunt.

He thinks their big whale management system is effective and good.

A key feature in making these things work is the social disapproval of community members against those who violate the rules.

[?] The system may be very cumbersome—many bureaucrats from Denmark in community I suppose, but I’m impressed with it nonetheless. There is much emphasis on local control, Inuit control, and certainly they are everywhere throughout this society, and not obviously subservient.

Jens says, “Who is nearest to you is yourself,” i.e., self-interest rules in the last analysis, but here the social pressure of the group is also vital.

The hunters are closest to the hunt and about the need for conservation they say, “We see the problem.”

Up at Tule the municipality has rules that keep the kill in check. They do this even though they have no real understanding of whale stocks. Jens says, “What this means is that they care.”

Most of the perception of a need for regulation comes from the municipalities. The Inuit Circumpolar Conference (ICC) has been negative to the rules produced by IWC. The municipalities can’t do enough to manage fully but must help improve the regulations. Nuuk and the small villages around it is a municipality. The laws for hunting and catching come from municipality, and the Home Rule government can, if it wishes, override.

They (Jens and Amalie) regarded the Greenpeace harp seal initiative as ridiculous. Such events generated by distant people with distant views. Their effects on the settlements has been disastrous because of loss of income from seal skins.

The Greenland National Radio links all parts of Greenland together. Each division (3) has ½ hour to which most people listen each day. There is an MC who has people on and reports local news: North/Middle/South. “We caught a minke whale yesterday,” etc., etc., etc. Kalaktitut is Greenlandic language and way of speaking.

I walked out into the brisk air and down to the water. I passed the open market. Lots of gutted reindeer, a couple of seals (harp seals, I think). All the fish were gone but a couple of small cod.

Down at the water I came upon some boys being instructed in the use of the kayak. they donned the skin hood, which attached to the ring around the hole in the kayak in which they sat, legs thrust forward. The skin hood went to the wrists and tied there, and up over the head. A drawstring around the face pulled tight and tied around the forehead and back of the head. Their paddle, double-bladed, had tiny blades, but it thrust them forward.

They had an instructor in chest waders, wandering around in the shallow water. When beaching, the kayak could be pulled, occupant and all, clear out of the water up onto the sand.

I'd guess the kayak had six inches of freeboard. It was very flexible.

I walked back up to the hotel and soon our crew gathered to exchange adventures. Moose had found the museum where the mummies were and a collection of *Ichthyostegia* fossils.

We had dinner at a combination bar and dinner place. Ev and I had eider duck breasts in gravy and a little salad. Dark and a bit gamey but very good, I thought.

Outside we were greeted by our first full-scale aurora. The sky hung with luminous white veils, while long snakes of luminous white, curved and twisted across the sky, grew, became brighter and faced while we watched. A hint of green and occasionally a little rose on the margins. We stopped and gawked like the tourists we were while the local folk flooded by looking down, unconcerned.

Then off to our respective rooms, getting ready for the homeward flight tomorrow.

On the plane to Iqaluit my seatmate is a fisherman, Marc La Meque, from New Brunswick. He fishes shrimp. He told me about the harp seals, all along the Newfoundland-Labrador coast—millions of seals he says. As a result of keeping the kill [?] 40,000 last year. In the water when trawl is pulled along, heads all over the place. This is the result of ceasing the kill.

I look down from the plane—30 minutes out of Iqaluit, through a stratus gauze and can see a scattering of icebergs on the blue sea, some I'm sure spit out by the ice fjord at Ilulissat.

July 16, 1993

Canada, Alberta, Edmonton

Phylly drove me to San Jose to catch my plane at 8:30 AM. I had too many bags (6), but they let me get away with it because I carried two. Too much junk, but then you need a tent and boots and lots of socks and clothes, a camera, tapes, for a month in the outback Arctic.

I'll fly tomorrow up to Yellow Knife, Cambridge Bay (on ____ Island) and then to Resolute.

The trip is with Dr. Tom Smith to Somerset Island where he studies the white whales and narwhals. We will hit Cunningham Bay for the annual coming of the belugas—as many as 2,000 in a 1½-mile-long bay—all scratching their backs and some

stranding—then south to an Inuit camp at Oreswell Bay, where we will watch an Inuit hunt for narwhals and belugas, and then, after my month, home to write it up.

Cloud decked and no land as we head straight north from Edmonton. I learned that there actually is a waterfall in town that can be shut on and off, and a big indoor mall and an artificial beach.

July 17, 1993

Resolute Bay, N. Canada

The flight north took me over almost untenanted land, so far as I could see from the air. The very occasional line of a road but mostly shining lakes and ponds, the braided, twisting courses of nameless rivers, green, yellow, amber-clothed forests—all but interminable muskeg forest and stream.

Our destination is Yellow Knife on the north shore of Great Slave Lake, a huge remnant of the Pleistocene ice now gone, and of the earth beneath rebounding from the weight.

I was in the company, mostly, of an elder hostel group headed for Cambridge Bay on Victoria Island and then northeast over the channels and islands to Resolute Bay on the Barrow Channel.

Yellow Knife sits on the north shore in a bend of rounded rock and gravel of Great Slave Lake on the planed-down rock. Scrubby spruce and aspen forest clings and fills the crevices. The lake seems shallow and dotted with what looks like rotten, dirty ice.

The town of two to three thousand has some high rises, quite a spread of houses, and broad, curving streets. It's on the MacKenzie and a shipping point north, and a transportation center for the northwest territory. The plane flights focus here.

15 degrees C. and not much in the air terminal. Thirty minutes later we were back in the air.

A new seat mate, Steve Mercer, a teacher at Cambridge Bay, joined me. He teaches 10th graders and only eight students got that far last year. He teaches everything. He was trained in economics in Toronto but teaches a lot of science. He didn't much like chemistry, he said. "What do the students do after they graduate?" I asked. "Nothing," he replied. He had a fishing and hunting camp near town—he had a \$5 license and could catch char and freeze them or dry them. [?] Victoria Island Caribou herd camp right around town at one season of the year. Now they are on the north end of the island. The migration is quite regular.

The town is small—1,200 people or so. They crowd into the terminal—affable people and smiling children. It was 17 degrees C. and the mosquitos had hatched in droves—big ones too. The elder hostel folks were looking a bit dismayed and swatting away.

Parallel ridges and strand lines from elastic rebound-related rising of the land above sea level. Victoria Island is very flat, a patchwork quilt of lake and ponds and low ridges. Alongshore is a rotten field of ice cracked into rectangular blocks and leads.

We rise quickly above the clouds, and a little later we come in at Resolute. the temperature has dropped to 5 deg. C. and light rain falls. May the mosquitos be stilled until they merely walk upon the shingle.

July 18, 1993

Canada, Somerset Island, Cunningham Inlet

We are in a 6-person helicopter about to take off. Lisa, Flip, Tom, the pilot, and I. We are going up to spot belukhas and narwhals. 700 animals in the inlet. 2,000+ last year max. We are going to fly to Garner Bay and east to Elwin Bay.

We are refueling now and will now take off to the coast. The gas is in yellow drums and we had to leave the cabin, snap our seat belts closed so they don't catch in the doors, and we are now back on board, the rotor going faster, beating hard, noise and pitch go up, and we are bouncing on finger tips, lift off, rotate, and away off the alluvial bench, out over the braided stream.

Tan mud, brown shingle, pale blue water winding, intersecting. Haze is low, patches of snow shining through, rounded, castellated bluffs, scree, and patches of white, the jade bay, rounded jigsaws of white ice. Raindrops jitter along the windows. A rank of male belugas below.

Males in ranks, tight nearly against each other, groups of 7-12, big shoulders, pale cream, wheeling together, a slow pavan. Four head to tail traveling with backs above water, inside fragmented ice in clear water at river mouth.

A few diving and rolling. Out we go. The animals are all at rivermouth. The number of belugas in the mouth is rising day to day. Build to 29th, first rapidly decline, by 5th they may be gone, by 15th all gone, all down in [?] Sound.

Flying east on Somerset. The ice is piled up against the shore fissured with green, against darkest ultramarine—angular broken, the mottled bottom showing clear through 20 ft. of water.

We fly parallel to a ribbon of fog. Twenty-one belugas moving toward Cunningham. The bluffs rise—sea bird country, Tom says. The alluvium bench ringed with rising land from elastic rebound. The topographic ridges go at least 500 ft. up mountain bluffs.

Ice—pools of jade water and dark rifts where plates of ice have broken into leads. We fly into haze and the island is obliterated. Kittiwakes white against dark water. Pale yellow sky against fog. Limestone cliff, vertical for 150 ft. Narwhal country—wide leads.

Irvine Bay, usually no animals here. Round rosettes in ice. Old ice providing breathing holes for walrus. Ring seals abundant here. Good population of polar bears that feed on them. Ice dotted with seals in June almost to Elwin Bay now. Narwhal more dispersed and solitary than beluga.

Elwin Bay. We fly along at cliff top height, back into bay and across river. Belugas to lift in dark water. Many in entrance in shallow water, grays, one rolling in bottom shingle. In little groups of 6-12, a few 2-3's. Streams of Elwin beach follow rectangular lines as do trenches without water.

We are coming to Batty Bay and will continue down to Creswell Bay and back. We'll refuel at a cache. Belugas in black water 6-10. There's a whole house full of belugas—100 or more.

Guillemot cliffs at Batty. Narwhals usually stay offshore but Tom saw a couple stranded. Tom scared off eight bears feeding on stranded animals—eight animals, ripped up by bears, still alive, but chewed on badly. One had its spine exposed. Maybe Creswell belugas are separate.

Inuits brought up from East Baffin Pond to Resolute but didn't like it and moved south to Creswell. Archaeology says thule people once lived there.

Andrew a minister in Anglican church at Creswell. He's taken over summer narwhal hunt.

Fury wreck, musket balls, salt beef cans, house where crew overwintered. They got out with whalers. Strewn all along beach berm, anchor chain, at water lines.

Melville Island at Bridgeport. Wreck, muskets, etc. Boarded up by Canadian National Museum. Fifty-six separate expeditions went out looking for Franklin.

Creswell Bay—Fury Pt. Entering outer bay. We will stay at Inuit Camp. [?]-Fletcher parachuted in to see if DC3 could land and I presume to select a landing site.

We land at a cache of five yellow fuel drums.

John Revanboer, young, affable, an excellent pilot, lands us at a cache of fuel drums at Creswell Bay. He hauled out a fuel pump and filter system that runs off of a battery. He put in 500 lbs. of fuel in a very short time, and we are off into Creswell Bay. It's brisk now. The clouds have lowered and it is near freezing. I find a crane fly walking jerkily along like a six-legged drunk. We take off up bay.

The big bay is choked with platy sea ice, rotting, pools of melt water atop the rectangular pieces and often enough perforated with round holes showing dark water through.

"Another week and there will be 4,000 animals in here," says Tom. "Go along the shore," says Tom.

We cruise 500 ft. over the shore, low-lying mist now and then blotting out our view.

We pass over the Creswell River, jade against brick-colored banks, then again over misty flats, rimmed with white ice.

"This is going to break up pretty nicely," says Tom. "By the time we arrive, there may be 4,000 belugas here."

We turn north and pierce through an opaque cloud and head for Cunningham. Peter Jess promises us dinner tonight. We all wonder how he can be making any money, given the number of visitors he can accommodate. His season is pretty much over by August 5th, when the belugas leave. He's put up a series of sleeping tents now so his people don't have to sleep in the dense bunk stacks he had last year. He has put up what looks like a plastic greenhouse now occupied by artist Mary Valentine.

Lisa Truitt, producer. They are doing *Life on the Edge*, *Edge of the Ice*, *Edge of the World*, etc. Good bunch. Lisa looks at the whales in the inlet and is blown away. Tom thinks there are 900 animals here now.

We set up camp in a light drizzle—then after the helicopter flight described earlier go down to Peter Jess's camp for dinner. I talk to the guests and to Peter's two great kids, Matt and Ted.

The trip around the island was splendid, fairly long. I got sleepy toward the end, but a great day all in all.

The clouds hung low. Creswell was full of ice, and on the way back we flew over the rounded, planed-down land, over the metamorphic section of the islands, where lichens turned the land dark. The land is lined with patterns—rectangles from ice and snowmelt, polygonal ground, swollen knolls (pingoes), and sweeping families of rivulets down the slopes. Now and then an erratic boulder could be seen lying on what was otherwise a field of mud.

We go down the channel of Cunningham Inlet to Pete Jess's camp. We all wonder how he can make it. Too short a season, too big a nut, too few entertainments. Yet Jess is

building a 24-unit hotel at Resolute and talking about helicopter skiing and a wildlife experience at Trulove on Devon Island.

[. . . notes]

Later on, at Creswell, I learn the wellsprings of the sharing system. There is no other way possible for an intimate village such as these are, nor was it possible in our tent even with no Inuits at all. We were much too close, too interdependent, too social.

July 19, 1993

Canada, Somerset Island, Cunningham Inlet

Good conversation over coffee. Tom tells of Holman, where he has a house—a town on Victoria Island, and when Adam, the general fix-it guy and much respected, killed himself with a rifle. Tom had heard a whistle—an air leak of some port, and this was instantly incorporated into the causality of the event—he had been taken, said some villagers.

The comment and problem in town with the thinking people—those who synthesize and look at gestalts of society—is “how boring it has become.” This in the face of this startling social change has left these people rudderless and without a thing to do. Sadness reigns.

Tom talks of his friend, Jimmie, with whom he was hunting that day and who slipped off the ice. Tom lay down on the ice and pulled him to safety and then they went into town to find the suicide and the whistle.

Tom says the problem of assimilation of Inuits into our culture stems from their resistance to changing their pattern of sharing, of entering into the pattern of monetary exchange for things that in their society were institutionalized patterns of sharing. They don't want to put values on things such as the supply of food, and hence the hunter who supplies 60% of the food of a village is technically “unemployed.”

The shamanistic system, with real roles, was not boring.

Tony says the giving patterns are first familial—the old receive food first and then the family, and then others. Tom points out that this is good evolution. I went off on altruism in society and the selfish gene, etc.

It is a gray day. Lisa struggles with the realities of trying to capture this event of belugas flooding into the estuary and the weather of the Arctic and the realities of helicopter schedules. It's a crap shoot at some level. Lisa wisely says, “Shoot a little—get something in the can.”

Today we may put up the tower (we don't). It will go on a bar out by a channel where the belugas pass close below. They don't seem to mind.

Lisa finally concludes to get film coming through the mist, of the animals, and not to pine for the stark, clear days when the sun shines down. I agree—more interesting, more evocative of the place.

I want to describe this place and our situation.

Cunningham Inlet is a two-mile wide slot in the northwest shore of Somerset Island, leading back to the south from Barrow Strait about four miles to where the braided, twisting channels of the Cunningham River reach the sea. Here on the west shore I look down from a bluff 200 ft. more or less above the water. Behind me the land rises still farther up to about a thousand feet when the swelling highlands of Somerset are reached. Riven with winding streams and lichen, gentle contours [?] where the highest

land is a bit over 1,300 ft. Everywhere the rock or soil define the landscape and even where lichen cover is strongly expressed, every feature of the underlying island shows through. Polygonal ground dapples patches of the land of the highland and where water runs in may trickle to the valleys down families of streams as if someone had raked the land curving downstream.

The thousand-foot bluffs and steps that define Cunningham are dark-dun streaked with white snow, a gray cloud deck above.

The water of the sound is still now; the ice has moved away and out where the river meets the sea, cluster almost a thousand belugas, scattered white against the pale, greenish-blue water. They move slowly, some splashing, many accompanied by young who throw their heads and now and then push their flukes into the chill air.

Most are near the main river mouth. A few have ventured up the stream channel half a mile. I can hear the snores and pops and squawks of the animals—the first a sound uncommonly like that of a tuba.

They loll and maneuver in the shallows. Some ranks of a dozen or more big animals move slowly, almost abreast together—big males, Tom says.

Tom will erect his tower on the main channel edge tomorrow—a conflict for the photographers who want no such structures in their scene.

They don't want our camp in their photographs either—206 ft. up the bluff we have a Parkall cook tent. Tom has a tight little wooden cabin (two bunks, a desk, shelves, a Coleman stove, and cooktable, and diesel heater, small windows, and thick insulated walls—all anchored with cables and 30-gallon drums full of rocks and gravel. A sign inside the door says: "Before going outside, check all windows around doorway for bears." The enormous forearm of a bear, just bones and ligaments is in a rock crevice outside. A shotgun is leaned inside, four shells in its magazine, to scare the bears away. We have seen none. I'm in a pop tent and so are most of the others.

The wind picks up a little. Scattered clusters of whales rise and blow a mile out the inlet. Where snow stripes on the defining bluffs stand white they leave reflections so like pillars of smoke that I, at first, puzzled about the source, and then I saw it.

Tom shows me where he will catch whales—a hook right below us and protected by an intervening bar from the main mass of whales in the main river channel.

He will do 3-5 animals—suction cups and dissolvable [?] that lasts 50 minutes.

Later, with the tide rising. If it is too high they must quit as the water over the bar is too deep. Bob and Russ are the capture team—the entire Jess camp is here up on a bench 30 ft. high, watching. Tom seems OK with this. Flip says that today the problem is that everybody passes judgment. Some in the camp may do so. Well said.

About five male belugas hang at the outside edge of the hook—too far out to pursue. They wait. Tom cancels.

Down below us in the hook are several belugas on the shallow bar—almost shallow enough to strand. I watched them for perhaps 20 minutes, focal animal-wise. There was mild interaction between what I took to be a group of adult males. My focal animal traveled very little distance—in two to three body lengths and only turned when another came within pectoral fin distance. It blew underwater in one such encounter.

In deeper water, groups of males traveled together at pectoral fin distance—six to twelve animals, often with backs (necks) arched at the neck and melon and upper jaw continuously out of water—what Tom calls "scanning." The animals in such a rank are slightly in echelon—one animal at another's eye.

These males drive around the bay purposefully, staying together—obvious groups. I can see four such groups right now, all out in deeper water away from the main channel.

The tide is going down and the gravel bars are appearing to define the river channel. A bleuvet tried to swim across in shallow water and for a few moments became stranded. There followed a wild thrashing of flukes, the spray white five feet above the animal. Whack, whack, whack. The animal made it off but so alerted the others that they all fled the channel out into the open inlet, leaving the river vacant.

The males travel in blind ranks, often [?] abreast. They move slowly along at the surface, heads arched up so most of their head and anterior back is in air—scanning, Tom calls it. They are covered with a tan film now, which Tom says will change to white as the two weeks they are here move along. The way they move is unique to these whales—cruising along like logs at the surface, heads bent up. Are they looking into the air? Maybe. I could see an eye from time to time.

Now and then the sounds from the whales rise as if there was some pulsation or contagion to them. Tuba sounds, balloon rubbing, squeals, then it goes quiet for a while with only the odd sounds can be heard.

The tide is dropping and maybe we'll try again. The people from Jess's camp are back. As Tom says, "All you can do is lose." Better to work alone. "You don't know who they are." Will someone pass judgment even though this is benign—suction cups and a release mechanism timed by a life saver. Some of them asked if we were going to bolt transmitters through the dorsal ridge. They know.

July 20, 1993

Canada, Somerset, Cunningham

Last evening I had dinner at Peter Jess's camp, rapped with the visitors, and gave them a talk about dolphins. They loved it. Jess has perhaps a dozen people there, now, sleeping in little tents outside. They include a usual crew of adventurous sorts, the daughter of Dick Leonard of the Sierra Club, and her pal, another teacher. Nice folks, doctors, an ant photographer, a retired doctor now photographer-essayist, and so on. I had three drinks and a glass of wine, a bit too much so I was glad to drink some water and go to bed.

Tom attempted a capture yesterday for Russ's instruments, but the shear pin on the outboard separated—it was nearly gone and the people from Jess's camp gave their glasses and cups back to the rolling bar (hot chocolate, drinks, snacks) and left.

I'm stashed in my pop tent just outside the Parkall and very comfortable up on two foam mattresses. So I drifted off to a good sleep after a lot of talk. Much of that around here.

Lisa and team have lifted off to make some runs over the bay. The weather is clear for them now and no one is on the bar so it will all look natural. I expect them any moment now to make a pass. They work on "Life on the Edge,"—a film.

So there are three teams here with Tom coordinating: Flip and me, Russ and Doug and Bob and Lisa, and then Tom, who will participate in the science involved in the captures. He tells me he's nearly run out of things to do here. The rubbing and shedding is what they do here. No mating, calving, etc.

Peter Jess, a smooth, entrepreneurial sort—bright, politic, organized—came in with the news that three belugas had stranded at Cape Anne—not far west—and that they had attracted a polar bear who had ripped one in half and was eating pieces. Tom will go down for an autopsy.

The helicopter makes passes over the channel just high enough that the belugas stay put. I hope Lisa gets her footage.

Word comes in that four belugas had been found with a polar bear ripping at them over at Cape Ann. Art Wolfe said there were 12 whales, 10 mortally wounded, and 2 were scared and swam off. We loaded the helicopter and landed at Cape Anne on a gravel bar. When we arrived, one was reachable by hook and rope and the divers had to go after the rest who were in three ft. of water or more.

Flip had his dive gear on and went in with a hook to retrieve one old white guy with a terribly scarred melon. Clawed and tattered with bites, a large (10 lb.) chunk of its back drifted on the bottom. Flip and Tom went in after others. Art Wole, wildlife artist, said “When we flew over, the bear was next to a young whale’s head and when we landed it ran off. there were 12 whales aground; only 2 seemed still alive, 10 of which have varying degrees of injury, blood, bites, and two were unscathed. Of 10 that had marks, 2-3 were still swimming.”

Lance waded out and found several were underwater and no longer mooring.

Jeff MacGinnis came in with the second crew. The fog whips by four of the animals now hauled into the shallows.

Tom talks to John, the helicopter pilot. There’s a lot of work to do here and I may have to stay all night. “Bring me a tent and a Coleman stove and some food and a sleeping bag when you come back.”

The whales are tattered with scratches and pustulated cratered skin and one with shallow rows . . .

“The whales are lined up like salmon spawning in a river.”—Flip Nicklin

The whales are now lined up on the shallows, blood streams from their head wounds. Tom says, “the bear normally jumps directly for the head—down into the water and grabs the whale under the chin and bites down.”

Their skins are pustulated and tattered, probably they are ready for the year’s shedding.

Tom: “You eak muktuk and you never get cold.”

“Why did they die?” I ask Tom. I think the whale bites down and crushes the skull. I hope to find out here.”

Tom: “The muktuk is good for you. This is great stuff.”

I try a piece he slices off the skin, blubber and a little of the underlying tissue. It is sweet, slightly nutty, and clear oil runs down my lips. It is tough and requires concerted chewing. I can see eating it would coagulate the mind.

Tom readies himself for dissection and measurements and sampling. He will sample various tissues for pesticides, PCBs, etc., as well as for pathology.

Two of the animals he will sample are grays and two white adults—one a male and one a female.

Tom looks up the shallow channel toward the heaped ice and the far black ridge along shore. “If the bears come back they will probably come from that direction,” he

says pointing down shore. He takes his 30'06 out of its sheath and carefully lays the gun on top.

The whales certainly died quickly. The kill was an efficient one.

A thule site lies up the hill, bowhead perhaps, 70-100 vertical feet above the sea, a house site with bowhead whale bones rising above the sea by the elastic rebound of the earth since the 6,000 ft. of Pleistocene ice left these planed-down hills.

Tom starts his work. He and Russ measure and record from a bleuvet terribly torn back of the head and on the flank. The whole side of the brain case is exposed. I cannot make out any punctures but they may well be there. The pectoral is sliced into three parts, probably by the bear's long claws.

I examined the wounds of all the belugas. All were the same. The whale had been held with claws on the anterior body. Families of five claw marks streaked the anterior chest. Thee bear in each case had bit down over the occiput, just back of the now dead, opaque eye. Two canine wounds ripped in above and two below as the bear took the whale's head in its mouth. Two were below, ___ apart, and then the bear bit down, probably piercing the skull and into the brain (maybe, maybe not). Each was the same. Efficient and likely quick and the ten animals lay dead on the flat.

While Tom and Russ sampled the four belugas—flensed them, opened the body cavity, etc., Art Wolfe and I walked up to a thule Eskimo house site about ¼ mile up onto the island slope. It lay at the mouth of a small gorge, on the flat that had once been the shore, three tiers up from the present beach—perhaps 50-70 ft. above the present shore. It is composed of perhaps six small living spaces reached through crawl holes. Rock slabs seem to have formed the walls and perhaps the floor [drawing].

Art had a tent up there—served us a cup of hot coffee and then I walked back down to the flats to the beach, where Tom and Russ were on their third animal. The wind is picking up. Bob comes in with the chopper, and in a little while we will take off for camp. Quite a day.

The bear took all he could—far more than he could eat, I suspect, and that may be the way of things up here.

I sat up in the copilot's place with Bob the pilot on the way back. He showed me the turbine jet engine that weighs 125 lbs. A gas jet bends around, generates a fire ball that goes through the pipe to the turbine blade that run at 600-700 ft.

I helped bag all the whale heads, fairly covering myself with beluga blood and oil in the process on my coat and boots. So what else is new? The view from the front baffle just flat out blew me away.

We rose off the shingle strand where the belukhas' carcasses lay, carved into sections, blood arcing out of the stream behind the berm toward the main entrance at Cape Anne.

We carried all our gear back to the chopper. The heads and buckets of [?] and bagged samples were put in the locker aft end, gear piled high, the personnel compartment. Somehow three men fit in and I slid up front surrounded by gear, trying to not to block a breather pipe with my foot.

We lifted off and tipped down a little, cutting along the shore at 500-700 ft. We traveled along the shore ice—white, lined with pattern—dark leads and malachite caverns under the higher ice. Old second-year ice formed round niches, polygonal cracks, and in between longitudinal lines of blue cracks.

We lifted off up over Somerset. It was starkly beautiful, a bit like Death Valley—tinted, vacant land, formed by water brushed by rivulets in families following the contours. The shadows of the winding canyons were black, almost purplish blue, the streams green, the sea jade, the snow immaculate white, the land pale brick red or tan, and where lichens grew the land was black. I watched carefully for life—caribou or muskox, but saw none—a moonscape. We lifted over the ridge, past a small lake and down over Pete Jess's camp, and then along Cunningham to camp. Most whales were gone and the tide was high.

We landed not 40 ft. from my tent.

Tom doubts that the bears' teeth broke the skulls of the whales, and I did not see it either, only cleaving the bone will show a cracking or piercing. If not, it's blocking their breathing in a welter of blood.

To go back to that beautiful flight—the light was stark—light hills, deep shadow—like the moon with water. I can't seem to describe it somehow.

Then came the task of getting rid of beluga blood on my clothes, and Russ's and Tom's. We rubbed our hands and blood spots with hand cleaner. Now, temporarily, we smell like gasoline instead of beluga blood.

Muktuk: Tom stood over the beluga, his flensing knife in one hand, with deft strokes peeling back the six-inch-thick blubber blanket of the whale as he explored his way through its body, taking samples of various tissues, kidney, muscle, liver, etc., which would later be examined for chemical contaminants and parasites.

"Want some muktuk?" Tom asked.

"Sure," I replied.

He sliced off a three-inch strip of epidermis bearing about an inch of blubber, handing it to me on the blade of his knife. I took it, avoiding the razor-sharp edge, and bit down hard. The gristly epidermis resisted like rubber, while the blubber ran from teeth with clear, sweet oil and down my chin, where I wiped it away with the back of my hand. (Deep in a beluga dissection, one cannot, it seems, keep clean.)

"You'll never get cold, if you eat muktuk," Tom commented, referring I assumed to living on a diet of beluga blubber and oil.

Killing a beluga: Art Wolfe said "When he first saw the kill, the bear was sprawled across the top of a beluga's head, biting down, "its front legs spread wide, holding the beluga's blubbery skin," and that it had left when the Twin Otter soared over. The beluga had circled the shallow water in a hopeless arc, streaming blood, and soon lay quiet on the shingly bottom of the cove, inert.

I could see by where the huge canines had entered that the bear had taken the whole side of the whale's head in its mouth, its upper canines piercing over the hapless whale's blowhole and the top of its skull and the lower canines far down the side of its head, below the line of the mouth. Families of five claw marks sliced into the whale's blubber from the spread-eagled paws, holding on.

"I don't think the teeth pierced the brain case, but we will have to look later when I clean the skull," Tom commented, as he severed and carefully tagged the . . .

The Annual Animal

Light in the Arctic is annual, and so are the plants and animals that live there. By July, when I arrived at 74 degrees N latitude, there was little difference between midday and 3 AM. It was one interminable crisp day, the ice cover had already broken and the Barrow Strait was full of drifting, rotting ice. Once the winter pack that choked Cunningham had begun to fragment in early July, the whales begin to straggle in. They seem to come from the east first, at the east end of Devon Island, from either the Greenland coast or the polynuas of uppermost Baffin Bay. Thence their move across to Prince Leopold Point on Somerset and then seem to follow a long east-west crack in the ice, or "lead" as Arctic folk call it. They reach Cunningham in early July, when the ice-choking Cunningham begins to leave.

If these whales, and it remains a question in the minds of scientists such as Tom, go across to Greenland then it is across the very top of Baffin Bay, up where Greenland and Canada tip together, leaving only the narrow between them. As fall avalanches toward the north, the whales move south. By October 1st, it is half day and half light and soon enough the sun will go below the horizon altogether, and on ____ later show over the horizon again.

Their first Canadian landfall may have been on the east end of Devon Island. Then they filtered[?] across toward the island on which I stood, Somerset Island, and made their way innto Cunningham Inlet. They had followed an east-west lead along shore that develops at this time of year, cracking along shore like a crack shooting through plate glass. They turn in at Cuningham, the first few appearing at clear water where the Cunningham River enters the sea, while behind them 4 km of ice chokes the mouth.

This coming is no casual thing. They must. They come in yellow with film and covered with old skin wrinkled and pitted, ready, it seems, to be shed. It is a dangerous time.

Many whales cruise slowly along with heads bent up and eyes in air, perhaps to keep watch for the polar bears that have learned to patrol the beaches beside the river mouth. Many, maybe most, belugas cruise with their heads up this way. They are alert in some group sense and yet one can walk the river edge a few yards from them and they do not leave. Yet they are on edge annd any signal from one of them will send the entire collection of animals fleeing to open water. A whale thrashing its tail because the tide had dropped and nearly left it stranded—an outboard started coughing to life. It is usually 12 hours later before they return, tiptoeing back into the shallow rivermouth.

The whales rub and roll over the shingle bottom, sending up plumes of mud. In 10-15 days, the yellow caste is gone, and the big animals are again white, and the shore drift contains skin fragments that have scrubbed free. They go on around to others.

I wondered how these whales-on-watch would regard a human dressed in white—a bear? Would they all panic and race for open water?

By August 24, days have just begun their tip toward winter dark. The whales leave the river mouths and at end of August move north to Barrow Strait and east again, either to winter huddled in an opening in the ice, produced by currents, but sometimes kept open by the animals themselves, rising to blow vaporish breaths into the bitter darkness, or perhaps they move south along the Greenland coast—it is not clear—passing village after village that takes from the passing front of animals.

In early spring, somewhere out in the bitter pack ice of upper Baffin, males and females come together and mate, and birthing of the little, dark calves started the year before, takes place.

They seem to feed most in summer, building up thick blubber for the winter, when access to air locks them to these small patches of open water.

The summer feeding seems most dependent on the shoals of Arctic cod, a fish of the Arctic Ocean and its fringes, and one whose range goes clear across the pole under the ice.

When the belugas feed, they may dive clear to the bottom, which is shallow around west of Somerset, save two deep holes of 450 m, and sonar traces show this is no obstacle—the whales may dive to the bottom even there.

So their year is breed and calve, move west to the leads, enter amongst and under the last ice to the bays and river mouths to shed, and all the while dive to feed as they move along building up blubber, wrinkling the old shrunken skin, and go east, to begin the cycle again. At no place along this circle are they safe—bears take their toll, but more rapacious are the hunters atop the rocks of Greenland coves.

Like prey animals everywhere, the beluga seems to taunt its predator when it can. Tom Smith tells of watching a bear walking along the water's edge, seeming to stalk the belugas a bit offshore.

Tom described it: "The bear walked in the water the way they do, and as the water deepened, the belugas began to swim under the bear. The belugas blew big bubbles that rose right under the bear, breaking all around him. He stopped his swim and looked down underwater, and then dove a little on the circling belugas. The bear surfaced and swam on again in a straight-line course."

The tower is all but complete now, out on the bar at the largest tributary of the river, right alongside water now dense with whales. Sometimes, for some reason, they begin thrashing out there and the river surface turns to white.

Dinner's over. I give another talk down at Jess's and will charge him a bottle of Lemon Hart rum for camp. Works out!

I go to my tent and read an article about Max Dunbar. He has a piece in there about parsimony and the impenetrability between levels of organization in nature that I must read.

July 21, 1993

Canada, Somerset Island, Cunningham Inlet

After breakfast I walk down to the edge of the inlet. It is full of whales. Out on the spit at the channel's edge, Tom and crew have erected a tower of aluminum pipes and braces about 15 ft. high. The whales pay no attention to it, now that the cable stakes have been driven and the noise has stopped. The whales line up in the swift outflow of the river, facing upstream. The closest are 15 ft. away. I can see their tightly folded tan skin, I can see their little dark eyes as they throw their heads free of the water. They are arranged like spawning salmon, their smooth, bulbous heads above the roily water, dozens and dozens and dozens of them, their wet melons shining in the low sun. They move and shift and call and flip over and stand up and circle each other.

They whistle, long wavering sounds. They squeak and bleat and especially pour out long, popping snorts like a horse whinnying and punctuating it all are their breaths. Just now a whale emitted a train whistle—the double note—no doubt about it.

[The following two pages are all wet, so bear with the transcriber!]

There is social structure here in these bands of animals. A group of about eight gray whales, the juveniles [?] in and behind a long rank of a dozen of the largest animals, the males in their segregated ranks.

I pick up a long strip of skin $\frac{1}{4}$ inch thick and 12 in. long from the water's edge, a shed fragment of old skin. Doubtless the new white skin will soon enough clothe these animals in pure white. It is limp and floppy, torn loose as a whale rolled and dug in the stony bottom.

Their bulbous heads are lined up like a row of floats in the water, hanging in the current.

Tom says: preferred habitat in winter 4-8/10 ice in winter.

Now and then one rises up until . . .

Perhaps 1/20 of the high Canadian Arctic population of whales comes in this bay at once. It is the wildlife scene of my long career. What words should I use—pageant? No, that speaks too much of banners and caparisoned horses prancing—an event of humans. Above all, this is not an event of humans. We have no real place here.

In fact, I have just walked down the gravel bar and into a scene whose parts were assembled far before humans penetrated here. The players are the turning of the Arctic year, the whales, and the bears, who stalk along the gravel bar on which I stand. They each know the rules of the equilibrium between their two species, a poise that is so delicate that signals quite beyond my ability to detect them, can set off a reaction.

A case in point. The channel is filled with 250 animals lined up, wriggling, tossing heads, jammed in, stationary as best they could in the current. Tom has in his hand a hydrophone. He walks a yard out onto the shingle and places the hydrophone in 10 in. of water. Instantly, there is a thrash from a group of old males a dozen yards away. They turn in haste, pumping hard and are gone, out into the open bay. The other whales farther off start, but do not leave. Was that little splash a bear's footfall?

The barrier between air and water was momentarily breached. What did they hear? Or see? The river was full of noises. River rushing, animals rolling, a blizzard of their sounds. What could they hear? How could they see a dozen yards into that narrow wedge of shallowest water. How little we know. How crudely do we guess at their world!

Yet, this is no pageant of nature. It is, instead, between death and necessity, an equilibrium built between bear and whale, each animal feeling the boundary for an advantage that almost certainly I have no way to sense. It has, I am sure, been this way far back in time.

[rewritten] This is no pageant of nature. That's a thing of humans and caparisoned horses. This was between just the bear and the whales, and it was one of those equilibria we find so hard to understand. Death here is near but the event so normal, so much a part of life that fear may only enter if an attack actually comes, a warning flash, an immediate mobilizing of defensive reaction, the flight. Fear could not otherwise be spent so unwisely. Yet, the two parties probe the edge, one seeking advantage, the other normalcy until one relaxes in unwariness, or the other makes a feint across the invisible line.

July 22, 1993

Canada, Somerset Island, Cunningham Inlet

Flip and Doug walk across the flat to the tower and take their places inside the canvas shelter at the top. They unzip the canvas ports and can look down right on top of the whales. I will take my turn later when the photographers have had their fill. Tom says: "Remember when you come down, zip the ports up or it catches the blast and may damage the shelter."

I walk back down along the channel full of blowing whales, lying still, or moving slowly this way and that. They rise now and then, throw their black-edged flukes, expose a curled pectoral fin, or stand up in the water, sometimes clear to the level of their pectoral fins. I scale the loose rock of the hill to my tent. I crawl in and zip up for a nap. The wind perks up as I read my book (*Man and His Gods*) and then doze off as a cold rain sweeps through. The tent seems dry enough—no drips—though I have little faith in the floor would stay that way, should standing water get under it.

About 4 PM, I put on foul-weather gear and make my way down to Peter Jess's and Judy Jess's Arctic Watch Lodge, where I will speak tonight about dolphins.

A wonderful shower, clean clothes. I take Ted Jess a stromatolite I found and I write up these notes.

Tom may be down there about now trying to catch and instrument a whale for Russ Andrews. I've had a chance to talk to him and he is first-class, I think. He's been around—navy, a saxophonist, very sharp, and very much tempered and balanced. He works hard at his equipment and at various camp chores. I don't think suction cups, which he will use one one test, will work however. The belugas are too used to scratching themselves on the bottom.

So, I left those two guys out in the blast on their tower cubicle, fading in and out of view in the midst, as I walked along inside long johns and flannel shirt, down jacket, and foul-weather gear.

These notes do lose continuity as various visitors stop by to talk.

Quote of the morning: "We've got nine more days of summer," says Tom. It could be spitting snow by August 5th."

Four belugas have stranded on the flat below camp, three big males in a blind channel left by the lowering tide and a blue calf out by the observation stand.

Lisa and Doug were photographing the three big ones and taking "wild sound." When they had finished, I shied a flat stone into the water, ten ft. from them. Their reaction was instant and large, as if a bear's footfall had hit the water. They thrashed and rolled and threw their heads free of the water, peering with their little, dark eyes.

I wanted to see if I could see them deform their melons toward the site of the falling stone, but I could not be sure they did it. Perhaps—the tops of their melons looked flatter, but maybe not. Russ will arrive and do his thing soon. It's a grand opportunity, though handling these big boys, even in this shallow water, is bound to be a handfull. They thrash and throw their heads, sending trains of waves against the bank. They're almost aground now, though there is enough depth that they can still twist around and maneuver stome.

The mosquitos attack even though it is not far above freezing. Boy, am I wrong. 9 degrees C.

I walk across the flat to the tower. There is a gray juvenile there, flapping on the shingle. It cries piteously in fear as I approach, and literally shakes as I walk around it. Its blowhole runs with a sheet of mucus. Blood runs from a dozen shallow scratches. Nonetheless, the shingle under its tail is red with blood.

The big males thrash—"and the ceaseless sea surges against the shore." (I pose for a picture for Flip. It's for the "On Assignment" page in the magazine.)

I climb the tower gingerly—I don't much like ladders these days. I didn't go through the hatch but sat on the platform beneath and watched the scene. The view is one

of the most remarkable in my experience as a field biologist—1,500-1,700 whales were lined up cheek by jowl into the river mouth and 200 yards or more along the beach, most propped on pectorals with round melons in air, others rolling and throwing flukes, a few stand up to the flippers, heads erect. The sound is continuous snorts, long, long whines, belches, tubas, bubbles, clicks, squeaks. The spawning salmon image occurs. Only these are whales. Tom calls them the “Salmons of the Arctic.” Very fitting. Big, white, docile, give food for the asking.

Russ catches another and Tom puts on the tail noose. The big, white animal settles down.

Tom has been given permission to work here but no money, so we [?] his camp and pay the freight. I feel for him. His work is excellent, groundbreaking, solid stuff, and he gets little credit from his bureaucrats. So he does this, and we break his peace. Tough, almost poignant situation, but one I'm very familiar with.

Later Tom and crew made a flight to site north of Wadworth Island on Peel Sound. We will strike this whole camp—taking a day—and fly SW by Twin Otter and helicopter. The strip is so short, it can land but not take off with a full load. It's a place where belugas come in a very small bay at the edge of the ice. The whales come in in numbers and can be seen in fairly deep, clear water.

While they were flying, I walked over to Jess's camp, and talked to the visitors. The Jess's have been very gracious indeed and fed us a steak meal with drinks. We later walked back to camp and slipped in our tents.

July 24, 1993

Canada, Somerset Island, Cunningham Inlet

This morning we rise, have a pot of coffee, oatmeal, bacon—Lisa and crew are wrapping up their filming. They've been getting a lot. Doug Allen has been up the tower filming. He dropped a lens in the water, but the only glitch so far in a very complicated operation.

Russ Andrews tested his heart monitor, and then a suction cup attachment device—and things work.

Today we will listen to the whales and record them. For me a few minutes of listening will do. I need to compare the underwater to what I could hear in air. Then I will be ready to move. I must say my inactivity is a bit of a drag. It's the bears that restrict. Here at Cunningham they may be avoiding the place because of all the people. But at Wadworth maybe not.

So the day starts. The day clears.

I climb the tower and make my way clumsily into the shelter at the top (Tom mother-hens me up). We sit on boxes and barrels, surrounded by a tangle of cameras and recorders.

Below us are ranks of white and gray belugas. Tom points out the age classes to me. Neonates are gray and about 40% the length of mom, to whom they stick like glue, almost always in contact, sliding back over her body. The yearlings may be darker gray than neonates.

A nursing bout by a yearling takes place right below us—a brief butting of mom's mammary area, who rests quietly.

I put on the ear phones. Immediately I realize that many of the sounds I heard in air aren't what I am now hearing. The underwater sounds are click trains, low, desultory, and chirps, warbles and whistles—in other words, most of these sounds are made by the

MLDB complex and coupled to water, whereas the stuff I described in air is burst-pulsed stuff, probably significantly made at the blowhole lips—airborne and hardly coupled to water.

The whales are visibly turning whiter—the yellow glaze disappearing. Insistent click trains and long, wavering whistles. Not an inordinate amount really considering that there are some hundreds of animals within earshot of my hydrophone, which is buoyed out from the tower base 40 ft. or so in 1-2 ft. of water, or so. In front are animals lined up in the current stationing, not all quiet, some pump slowly with their flukes and then where the water is quieter the formation is less obvious and animals turn and swim across the ranks, babies and yearlings circle and rub on mom, and big, bulky old males with neck ruffs of fat move slowly. They are essentially all in the river outwash—in low, salty or fresh water and their skins are hydrating, I'm sure.

In shallow water the whales may roll on their sides or even onto their backs. They show their pectorals often and in older animals one sees the rolled-up pectorals at the tip as if around a newspaper. I'm impressed with the time here the whales spend resting on their peccs. Does this cause the flippers to roll?

I clambered down gingerly, kissed the shingle, and walked back across the flat.

July 25, 1993

Cunningham Inlet

Camp breakdown day.

Everybody helps to do all the needed things we have to do to make our camp into a cache that remains here and other sling loads for the stuff that will go over to our new camp at Wadworth.

My major tasks were setting a permanent cache to leave here and getting all the kitchen supplies boxed and labeled, and then Lisa and I emptied the ice hole up the hill of all the cheese, salami, bacon, milk, etc.

Then I cooked dinner—a stew—no pot had the proper lid, but I prevailed, I think.

Tomorrow we will have an Otter and a helicopter.

The stew was good. My meat could have used a little more time, but everybody ate up hearty, and then we took down the Park-All. It takes about half an hour, and then everything is rolled and placed inside the big, wooden floor sections, which fold over on themselves to make a long box.

I'm sitting out against the wall of Tom's wooden cabin, which is snug, two bunks, a Coleman stove, a worktable, a diesel heater. The tide is mid high. Belugas are scattered along the shore below me—perhaps 30 of them, milling and moving slowly. The biggest group is nine and it has four young and a sub-adult gray. Over in the river mouth there is the continued roar of animals rolling, thrashing, swimming against the quite swift current. When the belugas leave, the river makes very little sound.

Earlier I watched similarly scattered animals to those below me and repeatedly I could see them blow underwater, producing a ring-like boil. It was common. Now for some reason, even though the animals swim in about the same places, I have yet to see it in this observation session.

There is head slapping between a dark little young and a white adult facing each other. Maybe she's mom.

An Arctic hare lippety-lopped through camp—a gawky, long-legged juvenile.

[Drawing of area.]

July 26, 1993

Canada, Somerset Island, Cunningham Inlet

There is a very dense group of 12 belugas moving slowly together. They are in three ranks, almost touching side to side, and with head over flukes of the rank ahead. Since the heads are up and they don't throw their flukes, they can move this way, one to two knots at most.

There are lots of blowhole sounds—a whine with the interruption of bubbles. I still see no underwater blows. Chip tells me his team is doing a time-lapse of the tide coming in—nine frames a minute.

The others have gone down to the Jess Lodge, but I'll stay here and read and then, doubtless drift off. I'm tired.

Later, I lie in the tent with my book listening to the river. I'm about 300 yards away from the main channel—up a couple of benches to a shingly bench where our camp sits. The whales in the channel make a sound like the rapids in a river—white noise. One can sometimes hear the thrash and beat of animals, but usually it just roars like water. Whale voices rise clear above it. The deep tuba sounds, the long, wavering sounds like someone learning to play a trumpet, now and then higher sounds and blows, the hollow sibilant rush of exhaled air, now and then a tail slap, a blat, a snore . . . rain taps ever so lightly on my tent. I hear footsteps outside, the readjustment of tarps over our gear, the rip of tent zippers. Tomorrow at about 9, we load for Wadworth Island.

The hope is to move camp to the coast of Somerset Island near Wadworth Island on Peel Sound. So a Twin Otter flight was taken after we broke camp. Flip, Doug, Lisa went. I was to go on the next flight, but the weather turned, and we could not get out. Clouds and fog here and the three isolated down the coast with rather little gear and not a great deal of food. We get another load of gear in so they are OK.

I walked up to Jess's camp and stayed on for dinner and they set me up with a nice bunk, sharing a room (canvas) with Pete's dad, Edmond. We shared WWII experiences. He was a navigator on Wellington bombers.

July 27, 1993

Canada, Somerset Island, Cunningham Inlet

All day we wait for the weather to break. It doesn't. On and off low clouds obscure the headlands and a very light rain spatters. A bearded seal comes upon the beach—it's twice as big as a ring seal. A lone musk ox grazes on the vast beach of the inlet. Ted Jess catches a lemming—a feisty little ball of gray-brown fur, trimmed with sienna around the belly. He bites Chip who tried to pick him up. The little fellow shows his displeasure by emitting a rapid train of sharp clicks.

I give a nearly extemporaneous talk on Arctic paleontology—geology, which seems well received.

We are hustled out to the riverbottom strip for an attempt at Wadworth. We swoop down over Flip and Doug standing by a pile of gear. They wave as we make a pass and pilot Monty decides the crosswinds are too high for a landing. The spot is on a shingle beach. They like a field at least 600 ft. long, and a bit better, 1,000 ft. long, for a loaded Otter. Unloaded, 350 ft. is minimum.

It's a vastly lonely spot. Bleak, treeless hills, gravel benches, and a great, winding river with not a bush on the banks, just shingle, and nearly offshore is ice, and far off the

dark land of Prince of Wales Island. The flight took us over the Somerset landscape—first sedimentary terrain, on the SW end of the island. It doesn't erode so clearly or plane down so nicely. It's rocky and rough.

A dozen musk ox graze in the river bottom of one big canyon—yellow-green with plants and looking rich . . . black shapes against the yellowish green. Our pilot, Monty, a blocky, quiet-spoken, perhaps Irishman[?], makes the decision. Too dangerous to land. The crosswind is pushing 20 kts., and the runway at the lower margin of capability. Two passes and we leave, heading back fairly low over the island—the undulating, vacant, ice-scarred land. There is so little vegetation that the soil decides color.

No belugas, though I saw some farther north. Tom says they'll soon be there.

The metamorphic rock—dark gray, the sedimentary tans, reddish rose, the streams flashing like winding mirrors. We cross Barrow Strait and into Resolute and hole up at the Polar Shelf facility—a fine, clean place to stay—dining room, reading alcove, with a lot of scientific papers from all the people who have worked out of Resolute—a pool table shuffleboard, a TV room. I watch the Blue Jays take the Orioles. Tom finds me a sleeping bag from the gear storehouse, and I'm set. Mine is at Wadworth with most of the rest of my gear.

July 28, 1993

Resolute Bay

We wait and the wind picks up. Tom makes a couple of anchors for narwhal capture. They are caught in a nine-inch mesh gillnet, set net. I write postcards, snooze, wash my little bit of laundry, visit the store, eat, BS.

We don't get out today. Good book on Canadian Arctic—*Canadian North of Sixty*.

July 29, 1993

Yesterday we didn't get out, but this morning in the middle of breakfast the word comes. Borek has shoe-horned us into a full schedule so we push aside the last pancake and pull our boots on and run for the planes.

Lisa, Russ, and I squeeze in behind the kayak and we are off.

Out over Barrow (it's become old hat when I leave off "Channel").

Ice seems solid off to the west. Past the island off Resolute (Griffith Island). Tan land striped with snow in clefts and canyons. The water is still and reflections of the land are snow striped and perfect.

Out in the main channel, rotten ice covers maybe half the channel. There are pale slicks between the fragmented ice—like paths of haze.

I can still see pale-green pools on the rotten ice, and the long fracture lines of earlier splitting.

The wind, at least this wind, seems not determinative. The splitting must come from upwelling or currents or ice pressure from the west—the circling of the ice on the great ocean. You could find your way through it now with a small boat.

Out northwest, toward the poles, first the magnetic pole off Melville Island and then a few hundred km farther on the rotational pole itself out on the bleak ice plane.

Clear, dark water below us now, then the northwest corner of Somerset. I can see Prince of Wales Island on the horizon now—a dark, flat band like the rest, planed down

flat by the ice cap, which is now gone. Tom tells me Prince of Wales is a rich place—bird flocks, musk oxen, bears, seals, walruses, and the rest.

I talked last night to Tom about an early spring skiddoo trek he took—4,200 miles of transects with Jimmie, his Inuit friend.

Tom got money to do a mammal survey for where a gas pipeline was projected—back and forth on a grid over the ice. Ring seals were scarce to the west and picked up as they moved east toward Cornwallis and Somerset islands.

He describes two encounters with polar bears. In one case one stuck its head in his tent with him inside. He killed it with his pistol—a photo shows the bear lying slumped outside the tent—a huge, white mound.

Then he tells of Jimmie in pressure ice sensing a bear behind him. He whirled and stuck a gun barrel in its face and it too began to die. Jimmie then shot off its feet in his anger and he left it dead. Another of these unsung odysseys.

We circle and land on the totally inadequate beach (to my untutored eyes, anyway). Russ and I could see nothing useful to land on out of either side of the plane and not much more once we were down. The Twin Otter can jump into the air. The runway was 350 ft. long—600 ft. is considered adequate.

Flat calm as we come in. Who knows what weather we will have to get out four days hence.

Are Doug and Flip chewing us out for our food and TV and beds? I'll bet not.

We begin our stall, flaps go down. The water below us like glass, the low sun reflecting. The beach rushes under us. The tires clatter on the shingle. The engine roars as we brake, and in moments, rock to a stop near the fuel barrel cache. The heavily clothed figures of Doug and Flip come up and open our door. We are down.

We unload and stand aside as Monty taxis down almost into the water and roars by, dancing and faintly bouncing into the air. He is off over the gravelly riverbank. He turns and comes over, low lights blazing, and is gone to the south.

Tom says: "This is a bear highway. We have to make camp out of the way. Up on that bluff looks good," pointing to a bench about 50 ft. above sea level and a ¼ mile back into a barren river canyon. A beautiful 75-yard-wide stream of cold meltwater sluices by over rushing rapids and into deep pools before sliding into Peel Sound. Later, I'm sure I saw the dark forms of, to my California eyes, huge Arctic char, switching and stationing in the swift, clear water. They reach 30 lbs. or so, reports have it.

Everything for the camp is loaded in the ATV trailers and they arrive at the bench where I await to help unload. It's an impressive pile—two big double-walled field tents, 10 x 14 or so—one for gear and one for cooking.

Tom asks us to concentrate our tents together so if a bear enters camp he will not get lost among the tents.

Everyone falls to with a will and soon enough camp is in place. I put up my dome tent and arrange my gear inside. Very cozy! I have a bag for gear related to appendages—socks, hats, gloves, bootliners, and another of the mid-body—it splits out about half and half.

The TV crew have their work cut out for them. They set up a big tent alongside the river and deal with bugs in their equipment.

The camp consists of two, double-walled long houses 10 x 14, everybody in their personal tents, an elegant john-in-a-tent, and a long, triple tent for the TV people down by the river. Tom prepares apple crisp and a big baking pan full of hamburger mix.

Now we wait for the arrival of the belugas to come down from Cunningham.

I spent a bit of time today photographing, using my new 70-200 zoom telephoto and other lenses. The plants came first—the drabas are in seed now. There is a plant that has a paired ovary like a *Primula*—or is that a characteristic of a saxifrage, I seem to recall.

Then there is a low, spreading plant with scaly leafed stems that are erect. In these, many had turned scarlet. It had a nodding bell [drawing].

The Arctic willow is with cottony seeds now. The little water seeps and pools are rich with moss, and a yellow-green alga streams along the slow streams.

I walked down to the sea edge (Polar Bear Highway). Flip was there with the rifle getting his beautiful Easy Rider outrigger kayak together. Tom says we are to go to the beach together and to have a gun at hand. He emphasizes that two guns in camp are enough. The greatest danger is for people to shoot each other, rather than to worry about bears. I'm sure he's right.

Tom also told us of an old Inuit lady who whirled on a bear and hit it square in the forehead with her hatchet. She then announced, "I'm not strong enough to pull it out—somebody else do it."

So dinner comes along. It is calm and warm, dinner is cooking, we have a shot of Peter Jess's rum, and all is well.

Tom is a helluva cook—very tasty hamburgers, apple crisp, scalloped potatoes, a shot of rum. He slices himself off a piece of the muktuk he has brought along. I take some.

The dishes done, Tom wanders off down to the beach. The sun still rides high; it will be a while before it touches the horizon as it goes round and round. The breeze picks up a little and it chills down, after a balmy day with us wandering in shirt sleeves.

Tom comes in with a big safety pin in his wool sweater—the sign of an Arctic man, he says. To pin his parka to his shell. I guess I understand.

"You know," Tom says, "that sense you have that a bear's behind you?" as if I did. I didn't but I could imagine it . . .

July 30, 1993

Canada, Somerset island, near Wadworth Point

It's after midnight now. I rise to go to the bathroom, a little tent and inside a bucket topped with a seat. Fall's on its way. The sun is low in the north and my shadow falls long against the gravelly rise of land behind camp. The light is rose-colored, tinting the ice fields offshore, making the dark hills up canyon lit with orange light on their promontories. It's still out, so the wind off the ice does not chill us unduly. I roll a stove to shore up a tent stake and find two tiny black spiders underneath.

I think, "If I were to travel north, and not too far as travels go, I could level out the path of the sun and when it would no longer dip, I would stand on the North Pole, out there to the north on the bleak ice sheet, which I can see from the mouth of my tent. I know such a trip is across wrinkled ice, from the spinning of the Arctic Ocean itself, which piles hard against the shores of the Canadian high Arctic islands, NE Ellesmere, Axel Heiberg, and others.

Much later I get up again and head for the cooking tent where I hear voices. Coffee's on and strong. A hot cup stirs me awake.

No whales yet. Pack ice, fissures and cracked ice offshore of 100 yards of open water, clear blue. I look both ways, carefully scanning the beach for bears—bear highway, Tom calls it. Flip is there already rigging his elegant kayak and Lisa, Doug, and Chip are at their big instrument tent, struggling with their gear. They are having one problem after another—the monitor is the wrong color. Later, their camera housing leaks and nearly gets their camera. Lisa hauls it out just short of disaster and then Doug tries to locate the leak—O-rings? stuffing glands? I left them still at it.

It was a lazy day for me, though the others kept busy getting their gear in order. Flip and Doug put on wetsuits and swam in the crystal clear river. Flip says it is full of char—most 15 inches or so, but two big ones twice that. So me seeing dark shapes switching is on the mark.

Flip and Doug both talked of the halocline—where the freshwater slid over salt—wavering, hazy. Below Flip talks of comb jellies and isopods.

I did a little birding today—out looking at eyestripes and wingbars and similar identification marks. Three semipalmated sandpipers walked the edges of a sea pond—probing, probing, and pretty fearless of me. I walked within a dozen feet.

A glaucous gull circled—large, nearly white, heavy bill, pale gray cape . . . predaceous, I'm told.

Tom says there are ravens here—imagine that. He says dumps draw them. How does that bird manage such a range and such thermal difference. Tom says they will kill seal pups, and peck holes in condensed milk cans. What a bird!

Chip had been south of the creek looking for musk ox, and I took the chance of going in the freight canoe when we had to pick him and his ATV up on the opposite beach, to get him across the river.

The canoe is big—it will hold four 45-gallon drums of fuel. He uses it for caribou hunting and much else.

I hopped in and we cut off along the shore and out along the edge of pack ice. I could see from the side, instead of from air, the patterned ice. The ice is divided in low, flattened hummocks, undercut by wave action into low, broad, mushroom shapes—in between are melted pans filled with fresh water and greenish.

Below one can see a haze of ice below the surface—I suppose about to rot and break.

Later I walked the cobble beach and heard a rushing splash behind me and offshore a bit. I turned and it was a little berg 12 ft. across and perhaps 6 ft. above water that had been undercut and finally turned turtle—in just a second or two—no warning. A canoe near it might well have been swamped or dashed to pieces.

I forgot to mention that we brought back an ATV in the freight canoe—rolled in sideways on planks, to rest at an angle, front wheels on the [?]. It was rolled out on the same planks at our beach.

Some guess tomorrow the beluga will come down from Cunningham.

I'm reading *Man and His Gods* by Homer Smith. What a human saga our religions have been, and what remarkable things we have believed in and run our lives by.

A good curry dinner. The sky is clear but hazy and the air nearly calm—restless—and the sun warm so long as the breeze does not come off of the ice-filled channel.

The sun is on its circle—now from the WNW, 20 degrees elevation, more or less. Yellow amber . . . at early morning when I first arose to relieve myself it was over our palatial outhouse. ESE and somewhere near the same elevation, except the bluffed hills made it seem lower.

July 31, 1993

Wadworth

No whales today. A nice clear day at the start with the light breeze off the island behind—and so it was shirt sleeve weather—maybe 58 degrees F. or so at times. Toward afternoon—it's now 9:30 PM—it clouded over—a deck at 2-3 thousand, stratocumulus, but still rather warm.

Russ dug the considerable hole and I built the box for a frost hole. He dug down to permafrost—2-3 ft. in the cobble and gravel of an ice edge channel. Then Tom came up to instruct us and we packed it in lichens (reindeer moss?) and then dirt. It has a double door and will hold a lot.

[Drawing with caption: Inner door out of driftwood and some old sheets of plywood]

Tom located a place where he can route a 550-ft. runway. Tomorrow we clean it of stones and fill the snow channels.

A great pork dinner tonight with three kinds of chocolate frosted cake and the last of the rum.

I wanted to describe our scene but first Lisa and Doug wrassled with a leak problem on their underwater video housing. Every once in a while it leaks. No real solution yet, though the last two times they tried it, it didn't leak. They're calling in parts.

I'm reading *Man and His Gods* and they've just arrested Galileo for proposing the heliocentric universe. The church did not like it. They then had seven equal planets instead of the earth in the center—one Jesus, one true god, etc.

August 1, 1993

Canada, N. of Wadworth, Somerset Island

It's turned bleak, though relatively calm. All the light wind has to do is come off the ice-choked sea instead of the hills. Up above, if the sun is out, it may reach 70 degrees F. I look down from our gravel bench and the sea is mostly ice—the pack goes as far as I can see, though shot through with channels.

We've seen ring seals out there but so far, not bears. Tom reports a sleeping pit of a bear, up above us in the hills. He says he thinks these let the bear get comfortable—provide a place for its hips.

Today was airfield day. Tom had located a fairly rock-free bench back in the canyon behind us, perhaps $\frac{3}{4}$ mile from camp—a long, undulating bench of fairly fine-grained material, only a scattering of boulders, about 500-600 ft. long from a dropoff in a bend of the river to a curve in the next bench up. [Drawing]

The airfield had a series of shallow channels across it that we filled. Russ brought the ATV, a trailer, and some shovels up, and we found a place up at the beginning of the upper slope where we found elegant loamy soil—it cut like cake. Filling the trailer we then upended it over the ditch, and then we spread it and Tom flattened by driving back and forth with the ATV. Voila, an elegant patch. It didn't take too long with all of us shoveling, including Lisa, to fill everything. We pried up the big rocks and filled the holes and Tom put a series of white plastic bags to mark the course and there was our

airfield. A lot better than the beach, which the pilot, Monty, would not use for takeoffs, loaded.

We hope he will like this one because if a Twin Otter can come in and take off loaded it will save a lot of money—moving the fuel in to make caches is the expensive part. The helicopter can convey very little compared to the Twin.

So we're now ready for a flight test, which will come in when we pull out, the 5th or the 7th.

So now we wait for the belugas. I look at that ice-choked sea—at 4-5 degrees C—and realize the environment these big animals inhabit.

Tom says that in a couple of weeks, there will be a freeze—a light one that will come and go on the sea. And then comes the fall—to the first week in February—everyone goes to sleep—travel by moonlight in December through January—the most immobile time of year. Most babies are conceived.

Hockey has become big. TV arrived in 1978. Tom came back in 1980 in Holman, and he was met by full dress hockey players.

So, we wait for the belugas. Tom and Flip will go off by helicopter do a survey of beluga and narwhal abundance—around Somerset. Then to Devon, work locally. He will work at the S. end of Peel Sound. Then we head off to Creswell Bay to catch and tag narwhals and belugas (5 narwhal and 3 belugas).

Our camp sits on a gravel bench perhaps ½ mile from the water and up perhaps 50 ft. above sea level. Behind us the rounded hills and bluffs of Somerset rise. A fine rushing river curves by a bluff just south of camp, where an alluvial bluff slides into the riverbed. Our camp has two Parkalls—or the smaller version, a tented john, and our separate tents set so a bear, if one wanders into camp will not get lost among them. Tom fears that someone opening a zipper will attract a bear—so stay inside while he deals with the animal.

The rain patters very lightly. I've ditched my light summer tent and feel grateful for my double down bag and two layers of foam mattress.

The river arcs around in a big bend and thence into the sea. It seems to keep the ice out a little. That's where we expect to see belugas arrive.

The sky is lined with gray clouds, Prince of Wales gray and low, the ice a rough jagged sheet. Does Peel Sound ever become open water? 4/10 ice at end of August sometimes.

Out in those bleak precincts somewhere are the belugas picking their way south in the leads between the ice. When the wind here [?] our hill shifts from off the sea, a deep chill settles over our lovely camp, the exported climate of the beluga's world. When winter comes the air the belugas must breathe will dip to 40 or even 50 below zero. Then the to me icy water must be protective to these whales.

We wait, we wait for them to appear out there. In their world but surely not mine. My wrap of two layers of down works where I do not thin it too much, or extend my arms outside into the cold, or write without my fingers being encased in double gloves. What does the beluga feel? He seems so at home where I have watched it.

August 2, 1993

Camp, N. Wadworth Island

Tom and Flip were to go off today by helicopter for a circuit around Somerset and on up to Devon Island with the goal of making counts of various marine mammals—especially belugas and narwhals.

But after they'd called in for the helicopter the weather began to close in around our camp. On the radio we heard it was snowing at Resolute. At our camp the clouds descended, long gray banks offshore and it began to rain—not heavy but continuously enough that I worried for tent leaks. A wet sleeping bag is not a good idea up here. The wind came in cold off the sea and then shifted from the canyon. It picked up and up, pressing tents down, including mine. I checked the stakes (inadequate at best) and piled on additional rocks and did my best to keep rain from running under on top of my ground cloth.

We congregated in the big long house where Lisa whipped up pizza for us all. I read my *Man and His Gods* book and the wind grew worse, pummeling the camp in a constant slat and thump of canvas and a flutter of thin nylon. I checked again. A pool in one corner but no damage and cold, cold, bleak, the sea gray under the cloud deck and no belugas. Needless to say Tom and Flip were grounded.

Both have now retreated to read in their tents. I sit in the long house hoping I hear the wind slowing a little. My old tent is hanging in there and the rain has stopped, but it is possible I may have to move inside the equipment long house if something goes. I go out and replace all my ridiculous small tent stakes and retrench everything and hope for the best. So far I'm hanging in there. The rain sheets horizontally across the face of the hills now and will soon be on us I expect.

Tom makes date squares and we listen to the wind. Lisa reads *Wonderful Life*. I'm finishing *Man and His Gods*. Russ has something about pioneers, and Flip and Doug are in their tents. I wish my feet were a little warmer but basically I'm OK, and this stuff will in time abate. Maybe our wonderful Arctic sun will shine through the fog and it will clear and calm. I'd like that. Damp gloves and cold feet are not my favorite things.

Finally, as the pummeling continued and the rain became near horizontal, I decided to move into the long house. Fine drops were going up under the tent fly and through the mesh windows. Mine is a summer backpack tent and not designed for this stuff. I found a place on the tent floor where the stones weren't too close together. The two foam mats helped, but not for the worst of them. So, I was ensconced in a perfectly dry tent and could listen to it bang away without concern for my duffel and bag.

A great game of hearts and then to bed. Tom had cooked up smoked meat and cabbage. Now if a whale would show up.

The last happening of the night. Doug decided to make death masks with aluminum foil. We pressed squares to our faces and left a note to Tom to guess who it was (he got everyone wrong).

Calm and hazy this morning. The sea is glassy flat and no belugas yet.

I flake out after breakfast, not having had my full ration of sleep—and try to fix the tingling in my fingers. Cold? Carpel tunnel syndrome?

August 3, 1993

Canada, Somerset Islsand, Wadsworth

I have a theory for how these big subrectangular cracks developed. There are big beach berms—high, wandering—a topographic line down an old beach. Then more or less at right angles to them are eskers—sub-ice streams dumping out, that are long, sinuous mounds of badly sorted but often quite well-rounded rocks. The land rose under elastic rebound making the families of beach berms.

The eskers tumbled and rounded rocks and were quite swift so they carried fairly heavy rocks and rolled them. Then as ice melted the eskers came to mark paces where the

ice thinned, dividing the ice over these extensive flats into blocks, squares, rectangles, and sometimes the continuing melt stream cut into the eskers so they left a berm on each side. [Drawing] (This can be explained differently as an ice wedge—a freezing phenomenon.)

(I've observed these berms and they aren't always on both sides.)

The eskers do not always go down grade but will swoop into hollows and up over low hills.

Finally, outwash rivers cut into the landscape gathering melt water and taking it to the sea as the ice retreated. [Drawing]

The rocks in the esker tracks can grade downward in the V-shaped water courses—as if the small stuff had washed away leaving larger rocks. These big ones are often pretty well rounded, tumbled, I figure in the sub-ice esker streams [Drawing] (It's probably a two-step process—first running water from melt then freezes to push up the berms.)

So we settle in and wait. Waiting's not always easy, but the wind and the rain give us much to do. Flip and Tom wait for the weather to break so they can take their flight.

Doug's out on a walk up the beach, carrying the 30'06 for protection. (He wasn't.)

The river roars on. The hearts game roars on. Oops. Dirty Dora falls, but Flip is gunning for Shooting the Moon—he did it! Everyone else gets 26 points.

We snooze in our tents, I in my big one, thankful for the protection, Tom in his homemade wall tent with tarps piled on top—dark inside but warm—he has a heater and a lamp on his chest to read by.

Elegant roast beef dinner, carrots, tomatoes with spices, coffee and cake at the end. Lisa has been our baker with Tom doing most main courses. An Antarctic card game courtesy of Doug—called _____. I come in second.

It blows lightly and coldly, the overcast is too low for a helicopter to go out. Tom and Flip want to do their survey. The film crew waits for belugas to show. They don't. Doug found a polar bear sleeping depression ½ a mile away. We have seen none. Fall's coming. I am writing lying on the floor of the big tent writing in thick gloves and still my fingers are cold, cold, cold. No place for bad circulation, I fear.

August 4, 1993

Wadworth

I had a cup of coffee (dope that I was) before going to bed, but it left me wakeful much of the night. I lay there listening to the wind whip the canvas. The night now consists of the light dimming down so that inside the double tent there's hardly enough light to read and my fingers soon chilled down so I would have to warm them inside the bag to go on. Finally, I warmed my hands and put on double gloves and then I could turn pages and hold my place with a big paper clip. I finished *Man and His Gods*.

This morning the overcast had lifted enough that helicopters were stirring. We heard only 15 minutes before its arrival that Walt [?] came in the Bell helicopter, and set down just N. of camp, and as he did so the light mist turned to snow. Flip and Tom readied their gear aboard, with Tom in front, photographing, and Flip in the back. They'll go down around Creswell Bay and up the east shore of Somerset and across to Devon and back to Resolute Bay, counting marine mammals, belugas, narwhals, bowheads, seals? Anyway, they'll be gone two days and just after that we slip camp and I move to

Creswell to a camp where the Inuit are taking a quota of narwhals mostly for tusks, which they sell for \$100 a foot for good ones. A Japanese was buying most of it for apothecary purposes.

It's cleared some now. This pack is a little farther offshore and quite a bit of open water edges the shore—but beyond is the jumbled and bleak pack. No beluga heads bob in the open water. They should come in the river where the underwater team can film them.

Some prints of the footage thus far came in and it's pretty spectacular stuff at Cunningham, as is the bear kill.

Doug is making an elegant beef stew. Chip and Lisa are out looking at nesting birds up creek and I write. It's a long poke, Matilda, with more inactivity than I like. I want to not be a trouble and a worry to Tom and I also am uncertain about my limits here. I understand the desert better.

The stew fills a whole roasting pan.

We play Blob. I lose ignominiously.

Lisa hauls out, miraculously, a pre-birthday present, a bottle of scotch. Considering my state of *deja vu*, it was the finest, finest of gifts, and its 48% alcohol lifted my spirits markedly, if not my blob game.

August 5, 1993

Canada, N. Wadsworth Island, Somerset

We sit in the warm cook tent with about two full days of rations. The wind pours by, slatting the tent—too hard for me to take down my little dome tent, which I want to do before it self destructs. So far it's holding up well.

It's bleak out, the sea cold and gray and the bay choked with pack ice. This offshore wind could blow it out into the channel. The wind is 25 kts. or so.

We talk to Flip and Tom—they're locked at Resolute DOING LAUNDRY, the devils, while we rot in our long johns. Lisa lightens our load by cooking a lemon cake. It's an adventure out here, just going to the john.

Thoughts on predators: The great white bear, an animal that eats people, is near to the surface of everybody's mind up here. We learn to look both ways emerging from our tent. We discuss where the rifle will be put in the tent, butt or barrel first, so it can be reached both by someone in or outside.

We discuss how to shoot and dissuade a bear—off just to the side into the rocks. Don't try to kill it unless in danger of actual attack. Place tents so there is a lot of space between the long house tents and them, so a bear won't get in between them and get spooked, and so gunshots won't hit someone.

Don't zip tent zippers if one comes in camp. It's an attractant. Stay inside. Then we see the practiced and awesome dispatch with which a bear deals with a 3,000-lb. white whale. Economy of action, no limit but the available number of whales to how many are killed. So much for economy of nature. A myth.

By the way in the rushes of video about the beluga kill, I could clearly see apparently uninjured whales standing by the wounded—at what risk to themselves. Some of these clearly could have escaped.

I'll go out into the blast now and retrieve my tickets so we can radio instructions to Resolute.

We read, have a game of Blob. I come out last. Lisa cooks spaghetti, Doug sleeps, we look at the sea for belugas—there are none—but the ice pack has been pushed quite a ways offshore.

The wind continues off the mountains and the temperature near freezing, with mist, at times rain, slush, snow, but not much. Doug and I sing songs loudy—H.M.S. Pinafore, Lydia the Tattooed Lady, etc.

Dinner is spags and Lisa has cooked a lemon cake with orange-almond glaze. The cake mixes and the digestives are in good repair—not sure about main meals. We plan to take stock.

We talk to Resolute. They talk piously of hot showers and laundry runs, though they too have been kept from finishing their flight series.

A guess is that the ice pack may have turned the belugas and perhaps they are on the other side of the island. It's probably like every other human prediction of what animals do—in our minds and maybe not theirs.

I solve how to deal with these bears—wear my reading glasses at all times and you can't see them or anything past 2½ ft. with any clarity. It relieves the mind.

How long will it blow? Will the whales arrive? Will we be reduced to eating muktuk from the frost hole? It's the Arctic fall and who can predict. Glad I'm not scheduled for Isabella Bay, over on Baffin, where Doug and Flip will go for bowheads. There are an identified 87 individuals, or thereabouts.

I marvel at the gulls, dipping and planing in this wind. Insulation of these little bits of protoplasm is truly remarkable. I saw what may have been a longspur and a glaucous gull or two. Tom says there are ravens up here. Amazing bird. We stand in the cook tent and laundry, shoes and the like [?] Doug sends in the weather—25 kts. wind, ½ mile visibility, 3 degrees C., drizzle.

We have a fine dinner with the weather howling and buffeting and raining and snowing outside. It's getting cold, now that fall has arrived.

I make my presentation of the Idaho tuber festival selecting its queen for 1993. A smash hit. We sing songs, play Blob (I win after three successive defeats). My confidence is restored.

Tomorrow we break camp preparatory to a flight the following morning (9 AM) to Creswell. I may stay three days or so, depending upon transportation. My flight is out on the 14th.

No whales here. Looks like they went the other way.

Greetings, everybody. Welcome to the Idaho Tuber Festival. I'm Billy Bob Scruggs, your host, and in real life a corrupt alderman from Bugaloo County, Idaho.

Tonight we have a real treat for all you lecherous ole rednecks. A contest to select and crown the Tuber Festival Queen for 1993.

Our first contestant is a real favorite of mine, Bobbie Sue Hardesty. Bobbie Sue has been selected by the Bugaloo County chemical industry as Miss Persistent Pesticide of 1993. Let's hear it for Bobbie.

(I change hats, take off my foul weather jacket and emerge in black long johns with bright yellow hair—polypropylene)

Bobbie, what performance are you going to give for us?

Bobbie says: The DDT in this costume has saturated my fat and it's all I can do to remember the first four lines of my song:

Bobbie sings "Up Against the Wall, Redneck Mother"

“Up against the wall redneck mother,
who has raised a son so well, 34 and drinking in a honkey tonk, kicking hippies’ asses
and raisin’ hell.”

Thank yuh, thank yuh, Bobbie.

The Wedding Song (Actually I sing this to uproarious applause while the chill
wind whips the tent.)

The Oceana Roll.

August 6, 1993

Pack up day. It took us all day and more to break this place down into little piles
to go here (Creswell) and little piles that go there (Resolute), or there (Fury Pt.). After a
long and agonized discussion, Lisa and crew are headed for Fury Point, where Lisa and
Doug will go in an attempt to get some underwater footage of belugas.

Lisa Truitt, a handsome, slim gal of 31, Nordic in appearance, began to reveal to
me her fears and I mine to her. She is a producer, and runs a magnificent program in my
view, weighing everything. The stuff she is doing here is very difficult in my view. The
weather can and does turn, fall comes like a rock, things break, people haven’t sent the
right stuff, the electronics makes a red picture instead of a colored one, and on and on.
And every move is boxes and boxes and boxes of stuff. Above all is a budget, large yes,
but up there looming over them, and beyond that whether or not they can fill an hour of
prime time. Tough stuff. For instance, Lisa wants to cut from the belugas at the surface of
Cunningham to an underwater shot of the animals that you can see—where? They fly
over ¼ of the Canadian Arctic looking for a place to shoot in clear water, underwater.
Finally they find one, Fury Point, but it has a steep dropoff and she won’t fake it, since
[?] doesn’t.

Anyway, she confided her fears of the bears, of going off in a camp with one guy
(Doug). She ended by singing a song that must have been running through her mind, “I’m
Not Afraid,” from Anna and the King of Siam. None of the others, she said, showed any
signs of fear. Doug just sings and laughs. Chip just smiles and does anything (he’s a
perfect silent cowboy type—from Montana, too). Russ just plans.

I told her I moved into the long house last night instead of sleeping, defenseless in
my tent, a larva waiting to be plucked out of the termite mound with a straw. I could at
least tie the door closed and prop a heavy box against it. All capable of being pushed
aside with one swat of a paw.

I slept in the vacant long house, my little tent flapping outside and the cold wind
sluicing down the canyon.

Russ cooked breaded porkchops and we ate up, sitting on this and that and
contemplating the morrow. We decide to leave the empty long house up (where I slept)
and the cook tent, and get up early (6:30). The chopper arrives at 9:00 AM and then the
Twin Otter. I got out in the first load to Creswell and Doug and Lisa next to Fury Point,
around the outside of Creswell.

This place, with its drifting pack ice and winds and loneliness begins to erode
one’s spirits after a while. So all will be glad to go. Tom flies in tomorrow and we make
the big camp move. It’s logistics, logistics, logistics. And it’s expensive, expensive,
expensive, done by air.

August 7, 1993

Creswell Bay, Somerset Island

I go out on the first load to Creswell in the Twin Otter. We had to helicopter everything 5 miles N on the coast because our field was deemed too short for take off (Twin Otter) loaded. I was very tired after a morning of helping sling and move the camp, so in spite of myself I dozed off after we had bumped into the air. These Otters can be backed up, a maneuver our pilot used to spin the plane around on the gravel beach line runway—a runway created by elastic rebound.

Down along the west coast we go and finally in over labyrinthine Creswell Bay and then over a narwhal-beluga camp of an Inuit family who have a season and quota for narwhals and who fish beluga for muktuk, a few miles away. The take will be the tusks of narwhal males and will be sold to a Japanese who is in the Chinese medicine supply business.

We land adjacent to a full-blown camp—plywood building and tents and vehicles alongside an absolutely flat, mirror-like bay, an island offshore and a long arm of steep-cliffed land off to the north—one can see the Pre-Cambrian basement of rocks, and a shield of Paleozoic (Upper Silurian) sediments that go out to a long point in the distance.

One Long House is up, and Tony Martin and Jack Ames greet me as I step off. We unload and haul stuff down adjacent to the long house. Really good to see them again. We are right next to the Inuit camp, leaving space for one another's tents. Thoughtfully stacked piles of rocks are around to anchor tents, in an otherwise gravelly landscape.

We contemplate what to eat, where to put the john, and Tony picks at his new transmitters as usual. He is epoxying them now.

His recent results from belugas tagged at Tuktoyaktuk are very exciting stuff. They once again show how we try to impose preconceived ideas on wild animals and they do as they damn please.

Four were tagged, three males and one female at Tuk three weeks ago, 10-16 July. Males all went north on same track then lost one after 11 days. All went into pack. Other two kept going to 76 degrees. One turned east, past Prince Patrick Island, Melville Island. He is now 200 km west. The other turned west and north and is now at 77 degrees N, 145 degrees W, but way up into pack where it is more than 9/10 ice coverage.

The female went east, to Victoria Island and then circled around to within a few hundred meters of where she was tagged. Then she made another loop of the same sort.

Amazing stuff. It completely upsets preconceived notions about stock separations and movements.

Tony still thinks the east stocks and west are separate. A Dr. Jim Clayton, Fisheries and Oceans at Winnipeg, has been using mitochondrial DNA and he thinks the stocks are different.

When we landed at Creswell at the Inuit Camp, the kids were out. Little boys and girls playing tag. The rule was you had to kick the oil drum and spin around, then jump the creek. Off they go, four of them up the rocky hill and back down the beach. Fulmars swoop by over the glassy water, converging on some food source. Over the hills storm trails twist in the upper wind, turned rose in the low light. Skiddoos, drums—lots of drums—clothes lines, an ice hole up the hill for muktuk and meat.

Andrew is 25-45, well-spoken in English, direct, and his extended family sluices around him. As Tom says, they teach their kids by observation—not by direct questioning or direct instruction.

We get the camp up in stages. Tony has arrived without a sleeping bag—imagine that in the Arctic. He is in full fiddle. All of his transmitters are lined up and he had doped them with some kind of goop. He then stuck on some duct tape and then mixed up a bunch of epoxy and then lined all of his precious creations in a box and gave us instructions not to touch them upon pain of death. He has a new wrinkle. His transmitters now have a duty cycle—they transmit in bursts and shut off for a matter of days and then come back on. Not much is missed by leaving such data out and his batteries are predicted to last ____ months. The records come out without long data spaces, but they hitch together in a long track that misses very little. Elegant.

Malcolm Ramsay, a polar bear expert from U. Saskatoon, hopped out of the plane, big mop of curly gray hair, decked out for cold in true winter boots with little valves on their sides. He told me a little of his work at Churchill when the ice pack comes in—the bears have been out on the ice subsisting on ring seals. He is working on narwhal stuff here.

I will try to talk to Andrew about the renaming of Somerset Island for his father. Nunavut—our land, Nuna—terra firma, Taleok—out there on the salt water, Immark—salt water, Innerk—fresh water.

My reading of *Man and His Gods* says that we humans have an almost infinite capacity to organize our lives around any concatenation of myths, so the situation of the Inuit is made vastly more difficult because the myths about nature begin to be operative in the USA and are spreading. The disjunction shows in hundreds of big and little ways—forcing us apart.

On the mythologia, or southern side—the perception that the human race is screwing up nature and that this has begun to affect the carrying capacity of the earth is operative.

Up here the Inuit are being forced away from their bearings, their social structure is attacked. Both are right, but both attack the other and the contest.

I call it mythology. What I mean is that a mythological remove has occurred between services of food and connections with nature in the support of the larger perceptions and goals that are necessary to save the earth.

Yet, the precious structure of Inuit society. The extended family, the observational learning of the children, the taking of their own food, as is opposed to concern for the less immediate surround, for the direct things of life.

There is a snowy owl in the Inuit camp, and I hear snow buntings outside. Tom says they are picking up insects.

Suddenly a call goes up. Flip is trapped in the john and about to fly away over the bay, really. The fly of the tent has become a spinnaker and with only two decent tent stakes on this fall nylon leisure tent, it threatens at firsts, in spite of the several large rocks I had piled inside it. We went out to find Flip lying on the floor, the tent zipper zipped up tight, with a real threat of ascension. After restaking we finally decided to take the fly off, and the pressure abated.

Flip describes it as follows:

I felt an extra layer of clothing on my back and then an explosive event took place. The tent was going to fly away. I lay down on the floor, the bucket between my feet spread-eagled, I lay down to anchor it. I was a little reluctant to call for help too loud. I yelled for help gradually increasing volume. Tony came first and then Russ. People then

flooded out, restaked the tent, with Micklin's body evident through the windward tent wall. He managed through it all to keep the shit bucket from upsetting.

"Hello, anyone there? I seem to have a little problem here," was the alert that called Tony, according to him.

August 8, 1993

The snow came while I was sleeping in my tent and then, since the snow was being driven laterally, it began to collect on the tent itself, under the fly and then it began to leak right over my sleeping bag. So, for the second time this trip, I had to move to the long house before things got soaked.

It snows and snows in the wind.

I stopped by the cook tent and Andrew had dropped by. We had a long, rambling conversation. He and Malcolm and Jim and Tom talked about everybody across the Arctic.

I asked Andrew where his father had come from before he came here—Pond Inlet.

Andrew had gone to school at Inuvik. The government gathered up all the children across the Arctic and then to school for eight months away from family. "Very hard," he allowed, for a child who had never been away from house or family, or had seen a building of more than one story. No bitterness in his handsome, open, direct looks. He smiles readily, revealing a gap tooth smile and talks about everything in his world. He's very interested in knowing how to prevent narwhal tusks from checking as they dry. He is thinking about a tourist operation. I liked him a lot.

The snow continues falling. We sit in the cook tent. Flip feeds us a good chicken and spags, Tang. I collapse another chair. I'm just too heavy for these K-mart specials.

If it clears, we'll try for a narwhal here and belugas off out farther in the bay.

We discuss crazy trips to the pole—mountain bikes, water skis (magnetic pole), motorcycles, ultralites.

The snow abates. I go out of the tent to an Arctic scene—all white domatiks[?] and four-wheelers, and oil drums topped with snow. The two boys are down by the calm bay, hatless, shooting slingshots at passing fulmars. Andrew emerges to wait for narwhals in the channel just off his tent. His day seems to start about midnight.

Tom, Tony, and others will go across to the island to attempt net a narwhal tomorrow. I may pack it in next time a flight from Resolute arrives.

But right now the wind blows and snow spits.

August 9, 1993

Canada, Somerset Island, Creswell Bay

I spent a nice dry night in the long house. The snow has all but stopped but not the wind. Outside the clouds cling over the Precambrian mountain across the sound and low over the alluvial island across from us. It's there that we expect narwhals to come skulking by. Andrew and crew will wait and shoot the males that come near. I wonder if there will be competition between our two camps. My guess is that Tom will handle it well.

One thing about this Arctic work—it comes in spurts followed by long sessions of inactivity where dishwashing and stories is the norm. Then comes the massive logistics of a camp move. Everything is taken down, boxed, put in slings, the helicopter comes in and

up it goes, dangling below the craft. You can see the craft respond in the wind—dangerous I am told, and then another load. Or the weather gets you, as it is doing now.

As for me, I'm a super cargo of sorts and so they defer to my supposed fragility. The inactivity gets me. So, the story is mostly in the case, and I'll talk to Tom about flights and costs, etc. It looks like the 12th.

My last aim here is to talk to Andrew, get the new spelling of Somerset Island, and the names of his kids.

I ask his children's names and he lists them all. Andrew speaks very well in perfect English. A bright, engaging man. I tell him I want to use the new name for the island of his father, but Andrew tells me to wait, intimating it hasn't been decided yet within the family.

The Stanwill Fletcher from whom the nearby lake is named is a man who parachuted in here when they first flew in, laying out a landing strip.

Today our camp was split into two camps, to catch a narwhal. Tony, Tom, Jack, and Russ have set up across on the alluvial island across from us and have put out a narwhal net—9-in. mesh, anchored out at right angles to the shore, in Zodiac and also one of Andrew's boats.

Flip and Jim Savelle and I stay here. We will cook dinner for their return at about 10 PM. They'll call at 7 PM. There's not much time (not many days) to get Tony's new transmitters on an animal, but in spite of wind and the temperature around zero they are trying.

I try to prepare a pork roast but the oven refuses to light. The stove is on a bit of a slant—on the gravelly beach on which the cook tent is erected. Maybe that's the problem. Anyway, I abandon the idea and at Flip's suggestion, cook pork chops instead. So, a meal for eight—boiled potatoes, melted butter and salt and pepper, the chops, flavored and spiced with tarragon, garlic, and rosemary (nobody objected). The garlic had been inserted while it was still a roast. Then I fried a whole pile of onions in the chop pans and scraped off the brown into them. Carrots in some sort of sweet sauce, prepared by Flip—and in they came from the bleak, cheerless island camp, into our warm tent.

Jim Savelle was assigned the task of peeling potatoes—and we soon learned that to Jim, nutrition is a chemical event—he had never, he confessed, peeled a potato before. I could see it was true as he whittled away, producing something like potato sawdust. Time was getting short so I had to relieve him and his eyes opened wide as the peelings flew. Jim says his mother had to instruct him that eggs should be removed from their shells before frying. He subsists on food packaged in boiler bags. Such a contrast with Tom's camp, which is elegant food, albeit with an emphasis on red meat that was a bit much for Lisa.

Jim is one of constant goodwill and spirit—full of fine trivialities. He's a history and aircraft buff, uncovering eclectically the stuff of Inuit history, Dorset tunes, or the Franklin voyage.

Flip doesn't miss much. He tells us of his time on the Exxon Valdez, and other assignments—of going under the hull to photograph the black water where the welders were cutting away.

Most time, Inuit camp included, is spent indoors, with brief forays outside to the bleak, snow-dusted world and the cold bay where fulmars flock and dabble for plankton and quarrel. I hear a red-throated loon through the tent wall.

It seems to be arranged. On the 12th an Otter comes in to take Jim Savelle south to Boothia peninsula and on its return it picks me up for the trip to Resolute Bay. Whether I stay at the Narwhal or Polar Shelf is not yet clear.

August 10, 1993

Canada, Somerset Island, Creswell Bay

I'll try to settle with Tom before I go and straighten it out later.

He's having trouble with Fisheries and Oceans, who seem unable to deal with a person of independent mind—I think, demanding such conformance is the death of science. No real scientist can flourish if not allowed to “say it as it is.” Universities are devices designed to provide a good garden bed for such curmudgeons as him and me. So science in governmental agencies is always watered down in the process. The only places it works are where a scientist sacrifices himself to act as a buffer, usually to be director—between the requirements of the political structure and the scientists—there being two mutually exclusive social systems involved. Tom is caught in the warp and wonders if he can take four years to retirement and the agency loses its best, true Arctic biologist—a serious loss for both sides and difficult for both Tom and the agency. There has to be a better way.

Have I described our camp? Not very well, I think.

We are camped on a gravel strand—a ribboned feature—50 yards above an often glassy bay. Just offshore, ¼ of a mile, are two alluvial islands, on the N. of which is the new camp. Between the two islands runs a channel and to the west of the camp island a deep, two-mile-wide channel bends around under steep dark gneissic cliffs to run east as a series of much softer-contoured hills of Paleozoic sediments and out to sea through the Sarvak Channel to Creswell Bay and Prince Regent Inlet. [Drawing]

The channel in front of us can be glassy or the wind can sluice down off the land and turn it gray and flecked with white wavelets. The land is dusted with snow now—the rocks still showing through, even where later it will be a blanket of snow. We have two long houses, the ridiculous john tent now anchored with big rocks and spare dunnage, and personal tents. The Inuit camp is more established—wall tents, a couple of wooden buildings—temporary knockdown looking—vehicles, drums.

It's very communal, very social in that we are driven into tents much of the time, the pace is slowed down to its essentials, even now. The communal society of Inuit folk is certainly derivative from this in part, their attitude toward sharing. One is very much aware of the intimate texture of others' lives. We are too. Much you don't expect emerges—Jim's jokes and trivia and cooking, Flip's wisdoms and jokes, Tom's skills, predilections, enthusiasms, and trials. We rush to the support of this man whom we have grown to admire.

Flip lent me his big, heavy Eddie Bauer down coat (immediately I have a new dimension of freedom. I can stand out in the wind, and, as I did, I can curl up under it and sleep—warm like a curled up sled dog. Next come feet which have always been chilled. The heavy, incredibly bulky boots the wise ones wear, buy freedom from cold feet. The best have an air lining and a valve to regulate pressure on aircraft.

I may read a little—Cheney and Seyfarttes “How Monkeys See the World.” In summary, they see many things the way we do, with allowances for the differences in size and mental development between the two of us.

I have radio duty. At 12:00 Noon, I call the island camp, just to check in. Flip is reading in his tent and Jim is probably sleeping in his tent.

We seem to have called past each other. Jack on the island, me on the shore.

Word comes through that I'm on the next Otter flight out. So, I get packed. It's no big deal as I've kept everything together and ready. So I stack up the bags inside the tent and go out to say goodbye to Andrew and the kids. He's fixing an ATV engine. He has his tools all laid out on an upside-down comatik (a freight sled) and the parts are laid out in orderly fashion. He comments: "In 12 years you learn to fix these things." He says: "Would you like to meet my wife?"

"Yes," I reply, "I would."

We walk down the beach to the canvas wall tent, open the flap, the tent is half taken up with a raised bed larger than king size by twice, about knee height. On it is wife Mary sewing, and grandmother whose name is Inuit and which I do not catch. Mary is sewing a parka out of caribou hide. She's matched colors and makes little puckers for the parka, for little, three-year-old Palacia. The stitches are neat and small, of thread not sinew. Grandma, old and a little immobile, speaking only Inuit, sits on the other end of the bed, or rather reclines, amongst the covers.

I admire the sewing, and then make my way out over the plywood floor and into the cold day.

The kids are following a snowy owl chick—18-in. tall, downy gray, big yellow eyes, and whitish feet. It waddles across the tundra and the cotton grass (the "cotton" of the seed heads is used for seal oil lamp wicks—laid out across the burning place, alight along its whole length). I took a suite of photos. Then my plane came in, jouncing on the gravel runway, turned, and came in near my gear. I climbed aboard via the inadequate ladder and there was Lisa, glad to leave her cheerless Fury Pt. camp to Doug and now Chip.

August 11, 1993

Canada, Cornwallis Island, Resolute Bay

We took rooms at the Polar Shelf facility. The dining room was closed so I did without dinner. It didn't seem to matter much. I took my delicious shower (my towel hangs in the tent at Creswell, so I used a T-shirt).

Tomorrow I may head for Edmonton if I can transfer.

I call Phylly—all's well at home. Pam and Mike are there. Shall I transfer my ticket, or shall I stay here and write? The extra expense would be Tom's and there's always the threat of a weather cancellation so I opt to go, even though the unfettered writing time is attractive. I'll try to get a reservation at Edmonton. I did. They'll meet me. Now laundry.

Oh, I wanted to describe how Andrew hunts. He gets belugas a ways down the coast from here—but fishes at camp for narwhals (he calls them "nar whales") with a rifle. He lets them pass by his camp nearly to the mouth of the Union River and then shoots them. They sink in the glass-clear water and when they lie on the bottom he can see their white bellies and then he retrieves them with a grappling hook.

Muktuk was being used as food but none was drying on the lines. But caribou meat was out on a table—heads, legs, hooves, and piled skins.

While waiting for a phone I met Michael Kingsby in the rec room of the Polar Shelf. He commented on the beluga situation at St. Lawrence about as follows:

1) Hunting caused the decline and even continued locally after it was officially stopped.

2) His bitch with Beland is that stranded animals and the figures for disease derived from them cannot be extrapolated to the population as a whole. The rest could be healthy.

3) The figures for the present population are a little shaky—though he seems to agree the population is rather stable at around 500.

4) He says there is no question that cleaning up the St. Lawrence is a good idea.

5) He smiled wryly when I said Pierre had an image problem and mention his use of TV a couple of times. All agree that cleaning up the estuary is a good idea, whatever the biology.

I try to leave but the place is socked in and they send everybody back to either the Polar Shelf or the Narwhal.

Hey! The kitchen staff—Jennifer, Helen, and Karen—come out with a cake and four candles, for my birthday. I give them hugs.

We have a brief flurry of hope as Air Canada is coming in, but the fog just gets thicker, and after hustling us all over to the terminal hope dies as the word comes in that they've turned . . .

I room with Mike Waskiewicz, who tends remote sensing weather stations scattered around the Arctic and Russia. He is a sculptor and naturalist who spends his time on the mountains. He speaks lyrically about the land, its ancient connection to him.

Mike has found some serpentine and comes back with two great boulders for his luggage.

The landmarks here are: meals, Star Trek, pool, sleep, a lack of exercise and something organized to do. Writing helped a little today.

August 13, 1993

Canada, Cornwallis Island, Resolute Bay

Breakfast with Helen, who tells me about cooking on Ice Island, a station that floated on an ice island in the Arctic Ocean and finally ran aground up near Ellesmere Island. A good many people (scientists) were on it, especially geophysicists doing seismic work for oil structures. She, a wonderful, buoyant spirit, loved it.

The weather is calm and clearing. I think Lisa will get out to Montreal today and if it holds, I will make it to Edmonton tomorrow and then home.

What do we know about the shrinkage of ice as temperature rises? Does it expand on a curve with lowering temperature? [Graph]

If there is such a curve there should be cracking at 90 degrees at the ice wedge edge (I was told this term by a young geomorphologist) as things thaw. Thus the 90 degree L's at initiation of cracks along ice wedge lines should occur, as it clearly does from the measurements I made (I eyeballed several dozen cracks). [Drawing] Thus, maps of Iowa are produced.

Apparently freezing and thawing of water in the ice wedge are thought to produce the berms one sees along major cracks.

When the sheet of ice melts, the runoff must be very striking in terms of volume because of the size of the cobbles one finds in the bottom of the ice wedges.

Lisa leaves today. We'll have a goodbye lunch with her, and then I'll make my way down to Buster Welch Aquarium, a couple of miles down the road. I want to see what the invertebrates and fish up here look like. He's a great shaggy bear of a man in suspenders. A beard tinged with white. He retires this year and apparently he and his wife will leave for the south. One wonders about a fixture such as he, and retirement. I wonder if he has my resources to meet retirement?

I put on my jackets, long johns, and knitted cap and walked the two miles down the gravel road to his aquarium. I passed a couple of lakes on the way, after bending around the south end of the airfield. [Map]

One lake is blocked off by fencing, I suspect as a water supply (Resolute Lake). Then I took the road toward Resolute Bay, which is choked with pack ice. The Aquarium sits on a long stone jetty, and is a long, rectangular building, mostly crammed with research tanks, experiments with urchins, a protist lab on the very tip, but with a few exhibit tanks on one side. They contained Arctic cod, sculpins, lumpfish, what look like *Cerianthus*, and *Tilia* anemones, a big, broad *Laminaria groenlandica* kelp, a curious isopod that looks a little like a caprellid, a *Strongylocentrotus* urchin, and a few other things.

I walked up to Buster's house—flying the Canadian flag—and knocked. Wife Cathy answered and invited me in. There was Mary Valentine, knitting a sweater for a Welch child. We had a piece of cake and a dram of Mary's scotch. I got Buster going on whale management. He feels as I do that no real management will come until the Inuit guide their own courses in the north.

Right now he says it is murder here at times, but much worse in Greenland, where everyone may shoot, whether they can retrieve the animals or not, and he too believes the population is drying up, as it has done in southern Baffin, Ungava, and E. Hudson's Bay.

He feels the Inuit, once relieved of our southern control will come to national management policies and may utilize existing caucasian biologists until they can develop their own. He thinks it may be a rough transition.

He agrees that density measure only mask the problem. He gave me a ride back. He said that Michael Kingsley headed a DFO lab in Quebec that was in charge of the beluga studies for St. Lawrence. Kingsley evinced lack of understanding about why his group and Beland were at odds, but then noted that Beland was using TV. I sensed the animosity of a scientist using the media. Common.

They drove me back to Polar Shelf where we had a great steak dinner, and a dessert called "Murder," which is a slab of double chocolate ice cream and literally a splash of strawberry sauce.

Now notes.

Welch talked of a recent Spanish expedition to Greenland, which he regarded as strange. I'll bet the sign at Rodebay came from this source—the one proclaiming the Embajada de Espana.

Thoughts for Story:
Start atop the tower.

Tony's new transmitters send signals like a line of dashes on a typed page—a track across the Arctic Ocean. A battery can last twice as long or more.

The management equation.

Into the hands of the Inuit and Greenlanders.

Sadness and boredom is all that's left once hunting and all that goes with it (the completeness of life) is gone—the hide preparation, the clothes, the six-hour waits over a breathing hole. It was not dull. Now, without the animals, that are the source of life, it threatens their very place on the land.

They must know that these non-Inuit scientists have cared very much for the welfare of Arctic animals and have given every bit of expertise and training they have. They are ready to help until the Inuit forge their own scientists.

It is no different in the St. Lawrence, really. the different scientists may argue about methods; such discourse may be spirited, even bitter, but the aim is the same—to right the wrongs of the earth. And this is also true of industries on the land, such as the great aluminum industry at Jouquiére. They too seek to learn and in their terms to right the wrongs of the earth.

Thrust in the Inuits hands, their fate, and what they will do with their land and the living things in their domain, become crucial parts of their own cultural survival. That is where it would seem to belong. They, the Inuit, know better than anyone, that to avoid the long sadness the beluga must thrive.